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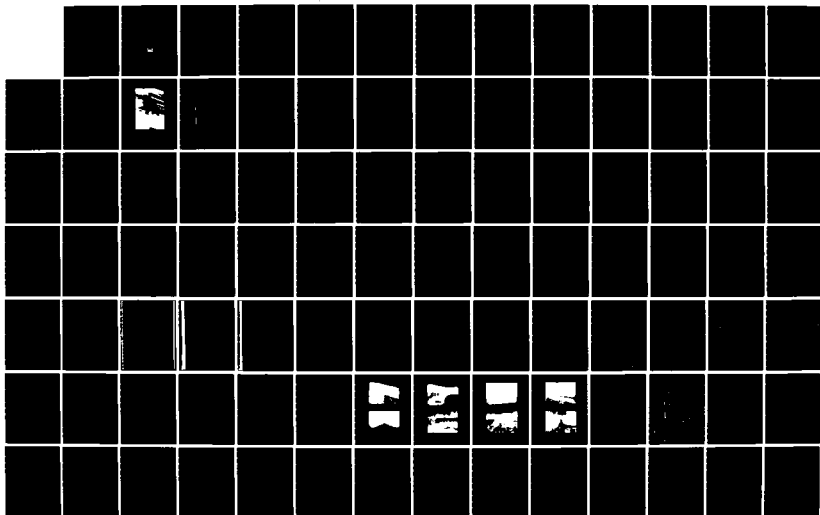
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
COLD SPRING RESERVOIR. (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV MAY 81

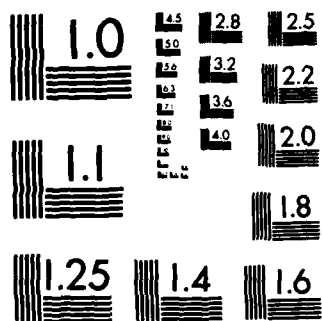
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CONNECTICUT RIVER BASIN
BLOOMFIELD, CONNECTICUT

**COLD SPRING RESERVOIR DAM
CT 00495**

**PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM**



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER CT 00495	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Cold Spring Reservoir Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		12. REPORT DATE May 1981
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18. SUPPLEMENTARY NOTES Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) DAMS, INSPECTION, DAM SAFETY, Connecticut River Basin Bloomfield, Connecticut		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Cold Spring Reservoir Dam consists of an earth embankment, approximately 1.040 ft. long, with a top width of 12 ft. and a maximum height of 20 ft. Based on visual inspection and review of available plans and reports, Cold Spring Reservoir Dam is judged to be in fair condition. The dam is classified as 'Intermediate' in size with 'High' hazard potential. A test flood equal to the PMF was selected.		



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

JUN 30 1981

NEDED

Honorable William A. O'Neill
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor O'Neill:

Inclosed is a copy of the Blue Hills Dam (CT-00496) Phase I Inspection Report, prepared under the National Program for Inspection of Non-Federal Dams. This report is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. I approve the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is vitally important part.

Copies of this report have been forwarded to the Department of Environmental Protection, and to the owner, State of Connecticut, Department of Environmental Protection. Copies will be available to the public in thirty days.

I wish to thank you and the Department of Environmental Protection for your cooperation in this program.

Sincerely,

C. E. EDGAR, III
Colonel, Corps of Engineers
Commander and Division Engineer

Incl
As stated



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COLD SPRING RESERVOIR DAM

CT 00495

CONNECTICUT RIVER BASIN

BLOOMFIELD, CONNECTICUT

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

IDENTIFICATION NO: CT-00495

NAME OF DAM: Cold Spring Reservoir Dam

TOWN: Bloomfield

COUNTY AND STATE: Hartford County, Connecticut

STREAM: Northerly Branch of Tumbledown Brook

DATE OF INSPECTION: December 16 , 1980

BRIEF ASSESSMENT

Cold Spring Reservoir Dam consists of an earth embankment, approximately 1,040 ft. long, with a top width of 12 ft. and a maximum height of 20 ft. In addition, there is a 140 ft. long dike, 2.5 ft. high, with an 8 ft. top width.

The two outlets for the dam are the principal spillway and emergency spillway. The principal spillway is a drop inlet structure consisting of a two stage reinforced concrete intake riser discharging through a 36" reinforced concrete pipe under the dam embankment. The emergency spillway is a trapezoidal grassed channel, 125 ft. wide at the control section with its crest 4.5 ft. below the top of the dam.

Based on visual inspection and review of available plans and reports, Cold Spring Reservoir Dam is judged to be in fair condition. Some features found existing that could affect the stability of dam are erosion of the dam embankment and the potential foundation and embankment stability problem resulting from the existing soil conditions.

The dam is a flood control project and, therefore, the reservoir is dry except during periods of heavy rainfall. With the reservoir dry, the inspection could not reveal seepage conditions.

It is recommended that the owner arrange for a qualified registered engineer to do the following within a one year of receipt of this report:

Inspect the dam during the time that water is impounded in the reservoir with particular attention to locating any possible seepage;

Reappraise the stability of the dam embankment and foundation using the "As-Built" configuration and giving consideration to existing seepage and soil characteristics.

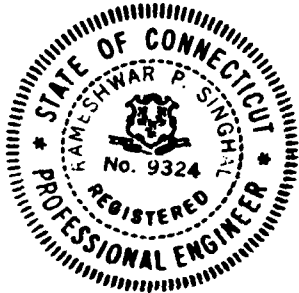
It is recommended that the owner repair the wheel ruts, low spots, and minor erosion gullies on the crest and slopes of the dam and dike embankments within one year of this report. Other remedial measures contained in Section 7 should also be carried out within a period of one year.

Based on the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, the dam is classified as 'Intermediate' in size with 'High' hazard potential. A test flood equal to the probable maximum flood (PMF) was selected, in accordance with the Corps of Engineers' Guidelines. The calculated test flood inflow of 2,620 cfs results in a routed outflow of 2,140 cfs. The spillway capacity is 3,720 cfs. with the water level at the top of the dam. The spillway is capable of passing 174% of the routed test flood outflow without overtopping the dam. The storage capacity to the top of the dam is 1,760 ac-ft. and up to the test flood level is 1,530 ac-ft. As the dam is a 'High' hazard potential and a potential breach may result in excessive economic loss and more than a few lives may be endangered, an emergency operation plan

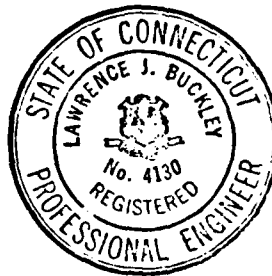
should be prepared and implemented if and when necessary. An operation and maintenance manual to take care of normal routine procedures should be prepared.

GOODKIND & O'DEA, INC.
AND
SINGHAL ASSOCIATES
(J.V.)

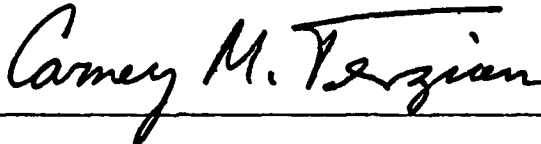
R. P. Singhal.
Ramesh P. Singhal, PH.D., P.E.
(Singhal Associates)




Lawrence J. Buckley
Lawrence J. Buckley, P.E.
(Goodkind & O'Dea, Inc.)




This Phase I Inspection Report on Cold Spring Reservoir Dam (CT-00495) has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.



CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division


JOSEPH W. FINEGAN, JR., MEMBER
Water Control Branch
Engineering Division


ARAMAST MAHTESIAN, CHAIRMAN
Geotechnical Engineering Branch
Engineering Division

APPROVAL RECOMMENDED:


JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the

condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety of the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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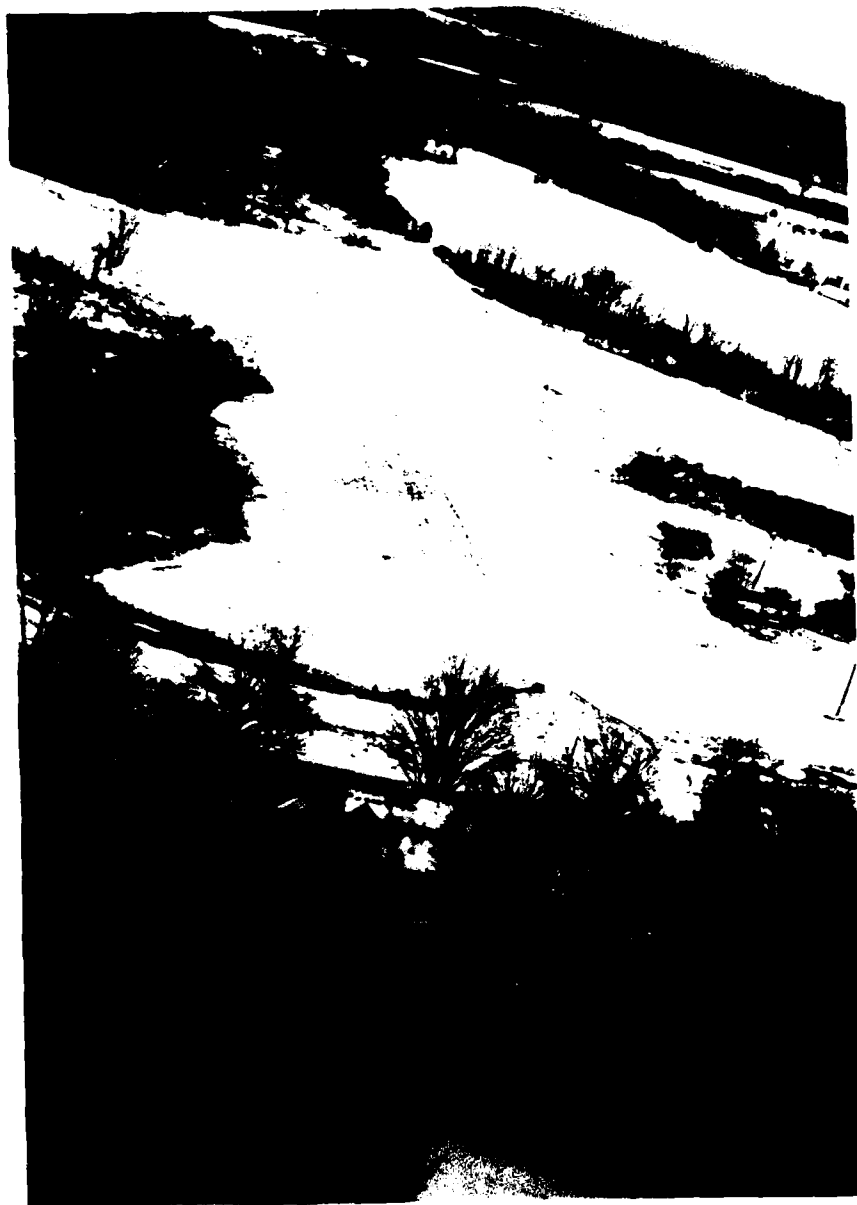
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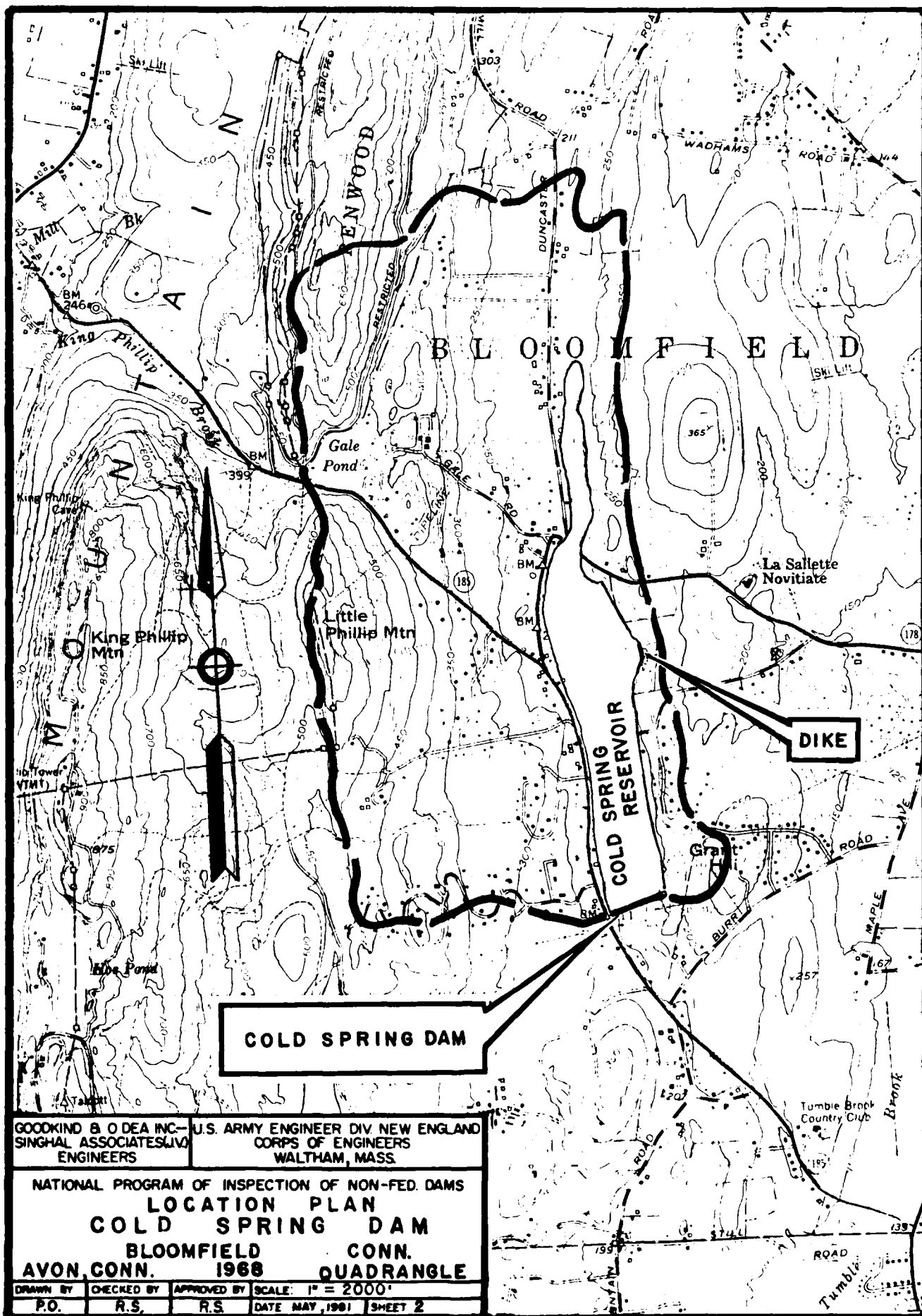
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NOTE:

OVERVIEW PHOTO TAKEN DECEMBER 20, 1980.

GOODKIND & O'DEA INC.- SINGHAL ASSOCIATES/LTD ENGINEERS		U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS			
OVERVIEW PHOTO OF DAM			
COLD SPRING RESERVOIR DAM			
BLOOMFIELD, CONNECTICUT			
DRAWN BY	CHECKED BY	APPROVED BY	SCALE: NONE
E.Y.K.	W.J.W.	L.A.B.	DATE: MAY, 1981 SHEET 1



NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

PROJECT INFORMATION
Section 1

1.1 General

a. Authority

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Goodkind & O'Dea Inc., Hamden, Conn. and Singhal Associates, Orange, Connecticut (Joint Venture) have been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed were issued to Goodkind & O'Dea Inc. and Singhal Associates (J.V.) under a letter of December 9, 1980 from Colonel William E. Hodgson, Jr., Corps of Engineers. Contract No. DACW 33-81-C-0022 dated December 9, 1980 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection

The purposes of the program are to:

1. Perform technical inspection and evaluation of non-federal dams to identify conditions requiring correction in a timely manner by non-federal interest.
2. Encourage and prepare the States to quickly initiate effective dam inspection programs for non-federal dams.

3. To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location

The Cold Spring Reservoir Dam is situated on the northerly branch of Tumbledown Brook, which flows into the North Branch of the Park River, approximately 5 miles downstream from the dam. The location is approximately 1.7 miles southwest of Bloomfield Town Hall and 0.3 miles north of the intersection of Burr Road and Simsbury Road (State Route 185). The geographic location of the site may be found on the Avon Quadrangle Map, with coordinates of latitude N41° 49.2' and longitude W72° 46'.

b. Description of Dam and Appurtenant Structures

Cold Spring Reservoir is impounded by a dam and a small dike. The dam consists of a grass covered earth embankment approximately 1,040 ft. long with a top width of 12 ft. and upstream and downstream slopes varying from 3 horizontal to 1 vertical to approximately 4 horizontal to 1 vertical. The top of the dam is at an elevation of 210.5' Metropolitan District Commission Datum (MDC Datum) - (2.08' higher than NGVD), with a maximum height of 20 ft. A gravel seepage underdrain system which includes a 12" perforated pipe with two outlets is situated on the downstream slope of the dam embankment. In addition, there is a 10 ft. wide, 2 ft. thick rock fill drainage system under two sections of the downstream dam embankment as noted on the general dam plan in Appendix B. Rock fill drain outlets,

10 ft. wide and 2 ft. thick and extending 5 ft. beyond the toe of dam, are located at 50 ft. intervals.

Prior to the dam construction, sub-soil investigations had revealed the existence of peat and organic materials up to depths of as much as 35 ft. below existing ground. The unsuitable foundation material was removed and replaced with granular fill. The excavated peat and organic material was placed on the upstream and downstream slopes and toes of the dam embankment as shown on Sheet B-2 in Appendix B. An impervious blanket, approximately 3 ft. thick extends from the impervious dam core to an upstream distance of at least 12 ft. beyond the granular fill line.

The dike, which is shown on the Location Plan (Sheet 2), is a grass covered, earth embankment approximately 140 ft. long with a top width of 8 ft. and upstream and downstream slopes of 2 horizontal to 1 vertical. The top of the dike is at an elevation of 210.5' MDC Datum with a maximum height of only 2.5 ft.

The principal spillway is a drop inlet structure, consisting of a two stage reinforced concrete intake riser discharging through a 36" reinforced concrete pipe running under the dam embankment. The 129 ft. long pipe discharges into the downstream channel which is rip-rapped a distance of 50 ft. beyond the outlet. The low level inlet of the intake riser is at elevation of 192.5' MDC Datum whereas the high level overflow weirs are at an elevation of 196.0' MDC Datum. Trash racks are located at both the high level and low level inlets.

Situated at the low level inlet of the intake riser is a 24" diameter steel sliding sluice gate. The gate mechanism is manual and consists of a gate stem and handle

The emergency spillway at the dam is a 125 ft. wide grassed trapezoidal channel. At the control section of the spillway the crest elevation is 206.0' MDC Datum, which is 4.5' below the dam crest elevation.

C. Size Classification: 'Intermediate'

According to the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, a dam is classified 'Intermediate' if either its height lies between 40 ft. and 100 ft. or the storage is between 1,000 ac. ft. and 50,000 ac. ft. The Cold Spring Dam has a maximum height of only 20 ft. but the maximum storage to the top of dam is 1,760 ac. ft. As such, it is classified as 'Intermediate' in size.

d. Hazard Classification: "High"

Based on the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, the hazard classification for Cold Spring Reservoir Dam is 'High'. A dam failure analysis indicates that a breach of the dam would result in a downstream flood flow of 55,700 cfs causing an 18 ft. high wave of water to travel down in the brook and along its overbanks on both sides. Continuation of the valley flood routing shows that even at the 4th cross-section, 2,800 ft. down, the excessive flow and wave height are as high as 36,000 cfs and 11 ft. respectively above the bottom of the brook.

The depths of flow in the brook in the vicinity of 20 downstream houses considered (the last one being approximately 3,000

ft. from the dam) range as below:

	<u>Pre-failure depth</u>	<u>Post-failure depth</u>
First 4 houses:	5.5 ft.	17.0 ft.
Next 3 houses :	2.5 ft.	13.0 ft.
Next 2 houses:	3.0 ft.	10.5 ft.
Next 11 houses:	4.0 ft.	11.0 ft.

Four of these homes are subject to partial flooding in their yards, below the first floor elevation, under test flood condition. In case of a dam failure these houses, along with the other 16, will be flooded to a depth ranging from 1 ft. to 7 ft. above their first floor elevation.

The dam failure would result in flooding of a large number of houses, public buildings and several important roads including State Routes #185 and #218. There will be excessive economic loss and more than few lives may be lost.

e. Ownership

The Cold Spring Dam and the Reservoir are owned by:

The State of Connecticut
Department of Environmental Protection
State Office Building
165 Capitol Avenue
Hartford, Ct. 06115
Telephone: (203) 566-7245/7244

f. Operator

Mr. Victor Galgowski
Superintendent, Dam Maintenance
D.E.P. (Water Resources Unit)
165 Capitol Avenue
Hartford, Ct. 06115
Telephone: (203) 566-7245/7244

g. Purpose of Dam

The primary purpose of the dam and reservoir is for flood control. Originally the Cold Spring Dam reservoir area was also to be utilized for a wildlife preserve under the supervision of the State of Connecticut Department of Environmental Protection. The low level inlet of the principal spillway intake riser was built with a manually control sluice gate which could regulate the reservoir pool level. Depending on the season, the water level would be raised or lowered accordingly, to avail the needs of the wildlife. This plan was never actually implemented and, therefore, the sluice gate has always remained open.

h. Design and Construction History

The dam and appurtenant structures were designed in the year 1960 by Anderson-Nichols, Consulting Engineers, Boston/Hartford, under the direction of the U.S. Department of Agriculture, Soil Conservation Service. Due to field conditions, certain design changes were made of which the most significant extended the limits of lateral excavation on the downstream side of the dam. Trapped organic material was discovered under the uncompacted granular fill through soil borings taken during the time of construction. The partially built dam embankment, part of granular fill, and the trapped organic material was removed and the limits of downstream lateral excavation increased. Additional excavation of organic material resulted, which was replaced with the uncompacted granular fill prior to the completion of the dam

construction in 1968. The other minor modifications are included in the "As-Built" drawings which are available from the Soil Conservation in Storrs, Connecticut as is the design report.

i. Normal Operational Procedures

Cold Spring Reservoir is normally dry with no permanent pool. The normal operation and maintenance is limited to cutting grass and brush from the slopes of the dam and cleaning the trash racks at the principal spillway intake riser.

1.3 Pertinent Data

a. Drainage Area

The drainage area consists of 1.94 square miles of gently sloping terrain. There are some steep slopes in the vicinity of Little Philip Mountain and Penwood State Park. Ground elevations range from a low of 190 feet to a high of 700 feet above MSL. Most of the area is open and inhabited with several town roads and State Route 178 and 185 passing through it.

b. Discharge at Damsite

There are two spillway facilities at the damsite. The principal spillway consists of a 129 ft. long reinforced concrete pipe under the dam embankment with a two stage reinforced intake riser on the upstream side and a rip-rapped channel on the downstream side. A sliding sluice gate is located at the low level inlet of the riser. The emergency spillway is a trapezoidal grassed channel 125 ft. wide at the control section and situated at the east end of the dam.

1. Outlet works (conduits) size: 1-36" RCP
 - Low level inlet invert elevation: 192.5
 - High level weir inlet elevation 196.0
 - Discharge capacity at test flood: 133.0 cfs
 - Elevation: 209.0
 2. Maximum known flood at damsite: N/A
 3. Ungated spillway capacity at top of dam: 3,720 cfs
 - Elevation: 210.5
 4. Ungated spillway capacity at test flood elevation: 2,140 cfs
 - Elevation: 209.0
 5. Gated spillway capacity at normal pool elevation: N/A
 - Elevation:
 6. Gated spillway capacity at test flood elevation: N/A
 7. Total spillway capacity at test flood elevation: 2,140 cfs
 - Elevation: 209.0
 8. Total project discharge at top of dam: 3,720 cfs
 - Elevation: 210.5
 9. Total project discharge at test flood elevation: 2,140 cfs
 - Elevation: 209.0
- c. Elevation - Feet above MDC Datum (2.08 ft. higher than the NGVD)
1. Streambed at toe of dam: 190.5 (Invert of downstream channel)
 2. Bottom of cutoff: Varies: Applies only to a small length of dam
 3. Maximum tailwater: N/A
 4. Normal pool: N/A
 5. Full flood control pool: 206.0
 6. Spillway crest 206.0 (Emergency)
196.0 (Principal)

- | | | |
|----|-----------------------------------|-------|
| 7. | Design surcharge-original design: | 208.5 |
| 8. | Top of dam: | 210.5 |
| 9. | Test flood surcharge: | 209.0 |
- d. Reservoir - Length in Feet -
- | | | |
|----|-------------------------|-----------|
| 1. | Normal pool: | N/A |
| 2. | Flood control pool: | 8,000 ft. |
| 3. | Spillway crest pool: | |
| | Emergency spillway | 8,000 ft. |
| | Principal spillway | 3,700 ft. |
| | (high level weir inlet) | |
| 4. | Top of dam: | 8,850 ft. |
| 5. | Test flood pool: | 8,800 ft. |
- e. Storage - Acre-feet
- | | | |
|----|-------------------------|--------------|
| 1. | Normal pool: | N/A |
| 2. | Flood control pool: | 1,100 ac-ft. |
| 3. | Spillway crest pool: | |
| | Emergency spillway | 1,100 ac-ft. |
| | Principal spillway | 240 ac-ft. |
| | (high level weir inlet) | |
| 4. | Top of dam: | 1,760 ac-ft. |
| 5. | Test flood pool: | 1,530 ac-ft. |
- f. Reservoir Surface - Acres
- | | | |
|----|-------------------------|-----------|
| 1. | Normal pool: | N/A |
| 2. | Flood control pool: | 137 acres |
| 3. | Spillway pool: | |
| | Emergency spillway | 137 acres |
| | Principal spillway | 60 acres |
| | (high level weir inlet) | |
| 4. | Top of dam: | 168 acres |
| 5. | Test flood pool: | 158 acres |

g. Dam

	<u>Dam</u>	<u>Dike</u>
1. Type:	Earth Embankment	Earth Embankment
2. Length:	1,040 ft.	140 ft.
3. Height:	20 ft.	2.5 ft.
4. Top width:	12.0 ft.	8 ft.
5. Side slopes	Varies from 3 hor. to 1 vert. to 4 hor. to 1 vert. for U/S and D/S slopes (See general dam plan)	2 hor. to 1 vert. for U/S and D/S slopes
6. Zoning:	Core: compacted impervious fill Outer shell: Peat & organic silt (U/S and D/S) Foundation: Uncompacted granular fill	Entire section is compacted random fill.
7. Impervious core:	Compacted impervious fill	N/A
8. Cutoff:	A 10' wide and a minimal 3' deep cutoff trench under small part of dam	None
9. Grout Curtain:	N/A	N/A
10. Other:	Gravel seepage under-drain system with a 12" perforated pipe under most of dam length. 10 ft. wide, 2 ft. thick rock fill drain under two sections of dam	N/A

h. Diversion and Regulating Tunnel

N/A

i. Spillway

	<u>Principal Spillway</u>	<u>Emergency Spillway</u>
1. Type:	Drop inlet structure consisting of a two stage reinforced concrete intake riser w/36" reinforced concrete pipe	Grassed trapezoidal channel
2. Length of Crest:	18 ft. (High level inlet weirs)	125 ft. (at control section)
3. Crest Elevation (MDC Datum)		
w/flashboards:	N/A	N/A
wo/flashboards:	196.0' (High level inlet weirs)	206.0'
4. Gates:	24" sliding sluice gate at low level inlet	N/A
5. Upstream Channel:	Relocated brook	N/A
6. Downstream channel:	Relocated brook with 50 ft. length riprapped at outlet	N/A
7. General:	N/A	N/A

j. Regulating Outlets

The only regulated outlet is the low level inlet of the two stage intake riser of the principal spillway. A 24" diameter, manually controlled, steel sluice gate regulates the low level inlet flow into the 36" reinforced concrete pipe.

1. Invert (Low level inlet):	192.5'
2. Size:	36" RCP
3. Description:	129 ft. long 36" RCP
4. Control mechanism:	24" manually controlled steel sluice gate at low level inlet of intake riser
5. Other:	N/A

ENGINEERING DATA
Section 2

2.1 Design Data

A comprehensive design report prepared in 1960 and entitled "North Branch Park River Watershed Protection Project, Design Report, Site No. 9, Bloomfield, CT", is available. The design report includes hydrologic and hydraulic data and computations, soil borings, soil laboratory test data, dam stability analysis and seepage analysis. Additional dam stability analysis were performed during the time of construction and are included in the design drawings.

2.2 Construction Data

"As-Built" drawings entitled "North Branch Park River Watershed Protection Project, Floodwater Retarding Structure, Site No. 9, Cold Spring Dam" are available. During construction certain design changes were made as a result of field conditions. Details of the contract modifications are included in the "As-Built" drawings. Of these modifications the one pertaining to the stability of the dam embankment included an increased amount of peat removal and granular fill replacement. Soil borings taken during construction revealed trapped organic material under the granular fill on the downstream side of the dam. The partially constructed dam embankment and part of the granular fill, along with trapped organic material, were removed and clean materials were replaced. In the reconstruction, the downstream limit of peat removal and granular material replacement was extended. A 1.5 horizontal to 1.0 vertical slope was projected from the dam crest to the lower

limits of organic deposit instead of the original design 1:1 slope. Also, a 1:1 slope was projected from this lower intersection point to the existing ground, thereby greatly increasing the extent of granular fill required under the downstream dam embankment. A rock fill drain was placed under the downstream embankment slope in the two areas where trapped organic material was found (See general dam plan and typical dam section in Appendix B).

2.3 Operational Data

Normally a pool does not exist and water level readings are not taken at any specified intervals. According to the owner, water levels have never risen to the level of the emergency spillway crest. No formal operation records are known to exist.

2.4 Evaluation of Data

a. Availability

Available existing data was provided by the State of Connecticut Department of Environmental Protection who are the owners and the U.S. Soil Conservation Service who designed and constructed the project. Location of the available data is given in Appendix B.

b. Adequacy

The engineering data available when coupled with the visual inspection were generally adequate to perform a Phase I assessment of the dam; however, additional information concerning the present condition of dam including seepage characteristics and stability analysis is required.

c. Validity

A comparison of record data and visual observations revealed no significant discrepancies in the record data.

VISUAL INSPECTION
Section 3

3.1 Findings

a. General

The formal field inspection took place December 16, and 22, 1980 by engineers from Goodkind & O'Dea, Inc. and Singhal Associates. Detailed checklists, which are given in Appendix A, were utilized for the inspection of the dam, dike, and spillways. Photographs showing the dam features and problem areas were also taken during the inspection and are included in Appendix C along with the photo location plan.

The general condition of the project is fair with some areas requiring further studies, or maintenance work and/or monitoring. At the time of the inspection, the reservoir was dry.

b. Dam

The dam is a grass covered, earthfill embankment with a gravel underdrain system on the downstream side. No sign of lateral movement or misalignment was observed as shown by Photos 1 and 2. Two low spots, each approximately 5 ft. by 8 ft. and 6" deep, were noted and are indicated on the general dam plan in Appendix B. Minor erosion down the embankment slopes was associated with these low spots, which is also shown on the general dam plan. The dam embankment was covered by a well developed growth of grass with minor vehicular rutting along the crest.

No evidence of any embankment or downstream seepage was noted; however the reservoir was dry at the time of the inspection. The two 12" seepage drain outlets were clean and dry, with one animal guard bar missing from the western outlet.

c. Appurtenant Structures

Principal Spillway

Consisting of a two stage reinforced concrete intake riser and a 36" reinforced concrete pipe, the principal spillway allows the normal flow of the brook and the impounded storm-water runoff to pass through the dam embankment. The concrete intake riser was in good condition with no sign of cracking or spalling. Located at the low level inlet was a sliding steel sluice gate which was open and presently inoperable. As shown in Photo 4, the gate stem was bent and the gate handle was missing from the sluice gate works. The upstream channel was clean of debris with some minor weed growth along the edges (Photo 3).

Minor exterior spalling of concrete was noted at the outlet end of the 36" reinforced concrete pipe. The pipe was over half full of water due to the flat downstream profile, preventing full interior inspection (See Photo 5). The rip-rapped area beyond the outlet pipe was clean and appeared stable.

Emergency Spillway

Located at the east end of the dam, the grass lined spillway was generally in good condition. The grass lining appeared stable with evidence of moderate vehicular trespassing

on the channel floor and cut slope as shown by the wheel tracks in Photo 7.

Dike

The dike is a low grass covered earthfill embankment located at the northeast corner of the reservoir, and appears to be used as a farm road (See sheet 2, Location Plan, for dike location). Severe vehicular rutting and very minor slope erosion was observed respectively, along the crest and slopes of the dike embankment. The upstream and downstream slopes and toes were moderately covered with brush and small trees as shown in Photo 8.

d. Reservoir Area

The reservoir which was dry at the time of the inspection, is primarily a flat, swampy lowland containing several non-inhabitable structures with a State road and several residential homes bordering it.

e. Downstream Channel

The channel downstream from the principal spillway was generally clean with some very minor brush growth along the slopes (Photo 6). The downstream profile is very flat and may be causing some backwater in the principal spillway pipe.

3.2 Evaluation

The general condition of Cold Spring Dam is good based upon the visual inspection. The following features could influence the future condition and/or stability of the structure.

a. Continued vehicular traffic along the dam and

emergency spillway could lead to erosion problems.

b. Further erosion of the dam and dike embankment may result in decreased structural stability.

The dam is a flood control project and, therefore, the reservoir is dry except in periods of heavy rainfall. With the reservoir dry, the inspection could not reveal seepage conditions. Thus, this inspection cannot in any way evaluate the seepage conditions that may exist when water is impounded in the reservoir.

OPERATIONAL AND MAINTENANCE PROCEDURES
Section 4

4.1 Operational Procedures

a. General

There are no operational procedures such as dam surveillance or reservoir level readings at this time. The emergency spillway was designed to be uncontrolled and, therefore, does not have any operational procedures. The principal spillway does have a slide gate at the intake riser, but the gate is presently inoperable and remains open year-round.

b. Description of any Warning System in Effect

There are no warning systems in effect.

4.2 Maintenance Procedures

a. General

The State of Connecticut is responsible for the maintenance of Cold Spring Reservoir Dam. The State mows the dam embankment and emergency spillway biennially, whereas the upstream and downstream channels are generally cleaned and cleared of debris and brush annually.

Representatives from the State of Connecticut Department of Environmental Protection and the U.S. Soil Conservation Service inspect the dam annually. A copy of the latest inspection report is included in Appendix B.

b. Operating Facilities

The State of Connecticut is responsible for construction, operation and structural repair of the flood control works.

4.3 Evaluation

The operational and maintenance procedures are generally satisfactory but there are areas requiring improvement. A formal operational and maintenance procedure with continuing records and a formal emergency downstream warning plan should be developed by the State of Connecticut Department of Environmental Protection. A list of recommended procedures for the operation and maintenance of the dam is listed in Section 7.

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES
Section 5

5.1 General

Cold Spring Reservoir was created along with three other reservoirs in the Bloomfield, Connecticut area in the 1960's to reduce flooding in the watershed area of the North Branch of the Park River. Detailed designs were prepared by Anderson-Nichols Consulting Engineers, Boston/Hartford under the direction of U.S. Department of Agriculture, Soil Conservation Service.

The Reservoir has a contributory watershed area of 1.94 square miles which is gently sloping except over small portions where the slope is steep. Most of this area is developed, having a good number of town and state roads, houses and other buildings spread over it.

There is the two stage reinforced concrete intake riser with the 36" reinforced concrete pipe acting as the principal spillway and the 125 ft. wide grassed trapezoidal channel, serving as the emergency spillway. The combined spillway capacity is 3,720 cfs with the reservoir pool level to the crest of the dam. The spillway capacity at the test flood elevation 209.0' MDC Datum is 2,140 cfs. The crest elevation of the dam is 210.5' MDC Datum which is 4.5 ft. higher than the emergency spillway crest elevation of 206.0' MDC Datum.

5.2 Design Data

Detailed plans, the as-built drawings and the original design report prepared by Anderson-Nichols, Consulting Engineers, are available at the Soil Conservation Service office in Storrs, Connecticut. Necessary design data is contained in these documents. Some changes had to be made in the design due to actual field

conditions encountered at the time of construction. Details of contract modification will be found in the additional drawing sheets attached to the original package. The design test flood inflow for Cold Spring Reservoir Dam was 6,700 cfs and the routed outflow was 2,110 cfs. The design high water elevation in the reservoir was set at 208.5' MDC Datum giving a freeboard of 2.0'.

5.3 Experience Data

There are no known records of reservoir levels during the times that water has been impounded at Cold Spring Reservoir Dam.

5.4 Test Flood Analysis

Based on the dam failure analysis, the dam is classified as being 'High' hazard potential in accordance with Table 2 on page D-9 of the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams. The test flood should be equal to the probable maximum flood (PMF) which was accordingly adopted for analysis.

An inflow peak rate of runoff was calculated for 1.94 square miles of watershed area. The terrain was judged to lie between the 'flat & coastal' and 'rolling' category. A multiplying factor of 1,350 cfs per square mile, lying between those for the two categories but closer to the 'flat and coastal' was selected. The test flood came out to be

$$\text{Test Flood} = \text{PMF} = 1,350 \times 1.94 = 2,620 \text{ cfs}$$

A triangular hydrograph was constructed using the methodology given in the "Hydrology, Section 4, SCS National Engineering Handbook". The peak inflow rate of 2,620 cfs and a total runoff of 19.0 inches for the PMF were used to construct the inflow hydrograph.

The flood was then routed through the reservoir, assuming an initial elevation of 206.0 ft. MDC Datum, which was at the crest of the emergency spillway control section.

The test flood produced a maximum outflow discharge of 2,140 cfs which is considerably below the maximum spillway capacity of 3,720 cfs, which is 174% of the former. The peak test flood elevation of 209.0 ft. MDC Datum results in a 1.5 ft. freeboard to the top of the dam.

5.5 Dam Failure Analysis

A dam failure analysis was made using the guidelines provided by the Corps of Engineers. Failure of the dam was assumed with the water level at the test flood pool elevation of 209.0 ft. MDC Datum and a prefailure routed outflow of 2,140 cfs. Assuming a breach size of 18.5 ft. high and 420 ft. wide (40% of dam length), the peak release rate into the downstream valley would be 55,700 cfs. The height of the flood wave came out to be approximately 18 ft. at the first cross-section (Sta. 7+60). Four cross-sections were analyzed, the last one being 2,800 ft. downstream from the dam. Flood-routing computations were done taking into consideration the available valley storage. The resulting flood elevations and the values of the routed flood flows are shown in Appendix D. At the last cross-section, (Sta. 28+0), the flow reduces to 36,000 cfs, and the wave height to 11 ft. which still have considerable potential of causing substantial flooding of properties further down from Overbrook Farm Road.

The depths of flow in the brook in the vicinity of 20 downstream houses considered (the last one being approximately 3,000

ft. from the dam), range as below.

	<u>Prefailure Depth</u>	<u>Post-Failure Depth</u>
First 4 houses:	5.5 ft.	17.0 ft.
Next 3 houses	2.5 ft.	13.0 ft.
Next 2 houses	3.0 ft.	10.5 ft.
Next 11 houses	4.0 ft.	11.0 ft.

Four of these homes are subject to partial flooding in their yards below the first floor elevation under test flood conditions. In case of a dam failure these houses, along with the other 16, will be flooded to a depth ranging from 1 ft. to 7 ft. above their first floor elevation.

A large number of roads, houses and buildings will be flooded as a result of dam breach. The economic loss may be excessive and more than few lives may be lost. As such, the dam is classified as 'High' hazard potential.

Dam breach computations are included in Appendix D.

EVALUATION OF STRUCTURAL STABILITY
Section 6

6.1 Visual Observations

The visual inspection revealed no apparent structural stability problems; however an area of concern was noted.

Minor erosion has developed on the upstream and downstream slopes of the dam embankment as a result of its concentration and runoff from two minor low spots on the crest of the dam. The concentraion of drainage is the result of vehicular rutting along the crest of the dam.

The reservoir was dry at the time of the inspection; therefore, any seepage that may exist when water is impounded in the reservoir could not be observed.

6.2 Design and Construction Data

Prior to construction, subsurface explorations revealed the existence of peat and organic materials down to depths of 35 ft. below the existing ground at the proposed dam site. The organic material was removed and replaced by a granular fill with excavation lateral limits determined by the intersection of a 1:1 slopes projected from the dam crest to the bottom of the organic deposits. Extension of a vertical line from this point of intersection to the existing ground defined the upstream and downstream limits of excavation; however, as noted in Section 2, the downstream lateral limit was modified during construction by projecting a 1.5:1 slope to the bottom of organic material and then extending a 1:1 slope back to the existing ground. The downstream extension of the granular fill

limits improved the foundation conditions under the dam embankment.

The excavated organic material was placed on the slopes of the impervious dam core where it provides additional counterweight to counteract lateral yielding of foundation soils. Original stability analysis were based on using the granular fill limits as defined by the design 1:1 slope from the dam crest and not the "As-Built" 1.5:1 slope. Therefore the dam stability may be increased by the additional granular fill placed in the downstream foundation; however, since the stability analyses were not based on the "As-Built" conditions, additional studies should be undertaken to confirm the stability of the dam embankment and foundation giving consideration to existing seepage and soil characteristics.

6.3 Post Construction Changes

The available data does not indicate any post construction changes.

6.4 Seismic Stability

The dam is located in Seismic Zone 1 and in accordance with Corps of Engineers' guidelines does not warrant further seismic analysis at this time.

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES
Section 7

7.1 Project Assessment

a. Condition

Based upon the visual inspection of the site, review of available data and past performance, the project appears to be in fair condition. There was no evidence of structural instability; however a conclusive evaluation of the existing embankment and foundation conditions could not be made without appropriate dam stability analysis. Any structural instability that may occur due to seepage when the reservoir contains floodwater was not evaluated due to the dry condition of the reservoir.

Based upon "Preliminary Guidance for Estimating Maximum Probable Discharge" dated March, 1978, peak inflow to the reservoir is 2,620 cfs; peak outflow is 2,140 cfs with the water level 1.5 ft. below the dam crest. Based upon our hydraulic computations, the spillway capacity with the pool level to the top of dam is 3,720 cfs, which is equivalent to approximately 174% of the routed test flood outflow.

b. Adequacy of Information

The information available is adequate for a Phase I limited assessment of the condition and stability of the project.

c. Urgency

It is recommended that the measures presented in Section 7.2 and 7.3 be implemented within one year of the owner's receipt of this report.

7.2 Recommendations

It is recommended that the owner employ a qualified registered engineer to:

1. Inspect the dam during the time that water is impounded in the reservoir with particular attention to locating any possible seepage.
2. Reappraise the stability of the dam embankment and foundation using the "As Built" configuration and giving consideration to existing seepage and soil characteristics.

The owner should implement the recommendations of the engineer.

7.3 Remedial Measures

a. Operation and Maintenance Procedures

The following measures should be undertaken within the time period indicated in Section 7.1.c, and continued on a regular basis.

1. Surveillance should be provided by the owner during periods of unusually heavy precipitation and high discharge. The owner should develop and implement a downstream warning system to be used in case of emergencies at the dam or dike.
2. A formal program of operation and maintenance procedures should be instituted and fully documented to provide accurate records for future reference.
3. A comprehensive program of inspection by a registered

professional engineer qualified in dam inspection should be instituted on a biennial basis.

4. Remove all brush and small trees from the slopes and within 10 ft. of the upstream heel and downstream toe of the dike embankment.
5. On the emergency spillway fill in vehicular scars, reestablish sod and vegetation.
6. Replace animal guard bar at the western seepage drain outlet.
7. Fill in ruts, minor erosion gullies and low spots in the dam and dike embankments, reestablish sod and vegetation.

7.4 Alternatives

This study has identified no practical alternatives to the above recommendations.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT Cold Spring Dam

DATE 12/16/80

TIME Morning

WEATHER Cold-Clear 20's

W.S. ELEV. _____ U.S. _____ D.N.S.

PARTY:

DISCIPLINE:

1. Ed Henderson (EH)

Geotechnical

2. Wesley J Wolf (WW)

Hydraulics

3. Gerald F Buckley (GB)

Soils & Structures

4. _____

5. _____

PROJECT FEATURE

INSPECTED BY

1. Dam Embankment (Earth Fill) EH, WW, GB

2. Principal Spillway - Intake Riser EH, WW, GB

3. Principal Spillway - Outlet EH, WW, GB

4. Emergency Spillway EH, WW, GB

5. Dike Embankment (Earth Fill) EH, WW, GB

6. _____

7. _____

8. _____

9. _____

10. _____

PERIODIC INSPECTION CHECK LIST

PROJECT Gold Spring Dam

DATE 12/16/80

PROJECT FEATURE Earthfill Dam

NAME EH, WW, GR

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT</u>	
Crest Elevation	210.5 ± MDC Datum
Current Pool Elevation	No Pool - Dry Dam
Maximum Impoundment to Date	Unknown
Surface Cracks	None Observed
Pavement Conditions	N/A
Movement or settlement of crest	Low Spot - 300'± From West End. Might be Settlement
Lateral movement	None Observed
Vertical alignment	Small Low Spot
Horizontal alignment	Looks Good
Conditions at abutment & at Concrete Structures	Good
Indications of Movement of Structural Items on Slopes	None Observed
Trespassing on Slopes	Minor
Sloughing or Erosion of Slopes or Abutments	
Rock Slope Protection-Riprap Failures	N/A
Unusual Movement or Cracking at or Near Toes	None Observed
Unusual Embankment or Downstream Seepage	None Observed (Dry Dam)
Piping or Boils	None Observed (Dry Dam)
Foundation Drainage Features	
Toe Drains	
Instrumentation System	N/A

PERIODIC INSPECTION CHECK LIST

PROJECT Cold Spring Dam DATE 12/16/80
 PROJECT FEATURE Intake Riser & Channel NAME EH, WW, GB
 DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u>	
a. Approach Channel	Excavated Channel
Slope Conditions	Good
Bottom Conditions	Good - Few Weeds
Rock Slides or Falls	None
Log Boom	N/A
Debris	Clean
Condition of concrete lining	N/A
Drains or Weep Holes	N/A
b. Intake Structure	Concrete Riser For Pipe
Condition of Concrete	Good
Stop Logs and Slots	Clean

PERIODIC INSPECTION CHECK LIST

PROJECT Cold Spring Dam

DATE 12/16/20

PROJECT FEATURE Outlet Channel

NAME EH, WW, GB

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITIONS
<p><u>OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL</u></p> <p>General Condition of Concrete</p> <p>Rust or Staining</p> <p>Spalling</p> <p>Erosion or Cavitation</p> <p>Visible Reinforcing</p> <p>Any Seepage or Efflorescence</p> <p>Condition at Joints</p> <p>Drain Holes</p> <p>Channel</p> <p>Loose Rock or Trees Overhanging Channel</p> <p>Condition of Discharge Channel</p>	<p>No Outlet Structure.</p> <p>— Flow Discharges From Pipe Onto Rip-Rap</p> <p>Excavated Channel - Rip-Rapped</p> <p>None</p> <p>Minor Earthen Obstructions & Brush In Channel</p>

PERIODIC INSPECTION CHECK LIST

PROJECT Cold Spring Dam DATE 12/16/80
 PROJECT FEATURE Emergency Spillway NAME EH, WW, GB
 DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u>	
a. Approach Channel (Before Crest)	
General Condition	Good - Scars From Vehicles
Loose rock overhanging channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Good
b. Weir and trailing walls	
General Condition of Concrete	N/A
Rust or Staining	
Spalling	
Any Visible Reinforcing	
Any Seepage or Efflorescence	
Drain Holes	
c. Discharge Channel (After Crest)	
General Condition	Good - Scars From Vehicles
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Channel	Good
Other Obstructions	None
* Note: Emergency Spillway is Grass Covered Earth	

PERIODIC INSPECTION CHECK LIST

PROJECT Cold Spring Dam

DATE 12/16/80

PROJECT FEATURE Earthfill Dike

NAME EH, WW, GB

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<u>DIKE EMBANKMENT</u> (Very Minor Dike,	Used as Farm Road)
Crest Elevation	210.5± MDC Datum
Current Pool Elevation	No Pool - Dry Dam
Maximum Impoundment to Date	Unknown
Surface Cracks	None Observed (Very Rutted)
Pavement Conditions	N/A
Movement or settlement of crest	None Observed (Vehicle Ruts)
Lateral movement	None Observed
Vertical alignment	Looks Good
Horizontal alignment	Looks Good
Conditions at abutment & at Concrete Structures	N/A
Indications of Movement of Structural Items on Slopes	N/A
Trespassing on Slopes	None Observed
Sloughing or Erosion of Slopes or Abutments	Very Minor
Rock Slope Protection-Riprap Failures	N/A
Unusual Movement or Cracking at or Near Toes	None Observed
Unusual Embankment or Downstream Seepage	None Observed (Dry Dam)
Piping or Boils	None Observed (Dry Dam)
Foundation Drainage Features	N/A
Toe Drains	N/A
Instrumentation System	N/A

APPENDIX B

ENGINEERING DATA

ENGINEERING DATA CHECKLIST

<u>ITEM</u>	<u>AVAILABILITY</u>	<u>LOCATION</u>
LOCATION MAP	Available	Metropolitan District Commission, Hartford, CT
AS-BUILT DRAWINGS	Available	U.S. Soil Conservation Service Storrs, CT.
HYDROLOGIC & HYDRAULIC DATA	Available in Design Report	
SOIL BORINGS	Available in Design Report	
SOIL TESTING	Available in Design Report	
GEOLOGY REPORTS	Available in Design Report	
CONSTRUCTION HISTORY	Not Available	
OPERATION RECORDS	Not Available	
INSPECTION HISTORY	Available	State of Connecticut Department of Environmental Protection
DESIGN REPORT	Available	U.S. Soil Conservation Service Storrs, CT.
DESIGN COMPUTATIONS		
HYDROLOGIC & HYDRAULIC	Available in Design Report	
DAM STABILITY	Available in Design Report	
SEEPAGE ANALYSIS	Available in Design Report	

DESIGN REPORT

NORTH BRANCH PARK RIVER WATERSHED PROTECTION PROJECT RETARDING STRUCTURE - SITE NO. 9 COLD SPRING DAM BLOOMFIELD, CONNECTICUT

The site of this proposed floodwater retarding structure is located approximately 1.7 miles southwest of Bloomfield Town Hall and 0.3 miles north of the intersection of Burr Road and Simsbury Road (State Route 185). The dam is situated on the northerly branch of Tumbledown Brook, a tributary of Wash Brook.

The geographic location of this site may be found on the Metropolitan District Geodetic and Topographical Survey Sheet 126, published by the Commission on Regional Planning, Hartford County, Connecticut, by scaling 3.2 inches north (latitude $41^{\circ} 49' 11.3''$ north) and 10.7 inches west (longitude $72^{\circ} 45' 57.9''$ west) from the lower right-hand corner of the sheet. Sheet 5 of this report is an overlay which, when placed on the appropriate latitude and longitude of the Metropolitan District Geodetic and Topographical Survey Sheet 126, will locate the proposed dam.

This dam, designed as a Class "C" structure, has a watershed of 1,240 acres. The foundation material of the central section of the dam presently consists of peat and organic silt, which is unsuitable. A suitable foundation of granular fill will be provided by a combination of excavation and displacement of the peat and organic silt. The dam will then be constructed of compacted impervious fill. The principal spillway will be a single stage drop inlet spillway with a reinforced concrete pipe 36 inches in diameter and a reinforced concrete riser, 3 ft. x 9 ft inside dimensions. It will rest on a foundation of silty sand.

An emergency spillway with a base width of 125 feet and crest elevation at 206.0 ft. (MDD) will also be provided. The maximum velocity at the control section will be 6.72 feet per second for the design flood. The frequency of use will not exceed a one percent chance.

ANDERSON NICHOLS & COMPANY

A rectangular low flow orifice, 1 ft. x 3 ft. , will be provided in the face of the riser to pass base flow of the stream and maintain a "dry" sediment pool. The invert elevation of the low flow orifice is set at 192.5 ft. (MDD) on the assumption that the accumulation of sediment will be negligible in the vicinity of the principal spillway. The crest of the riser is set at elevation 196.0 ft. (MDD). The riser was used to provide a simple means of vortex control and to facilitate the construction of an adequate trash rack.

The drawdown time was computed to be 10.28 days from the crest of the emergency spillway to the crest of the riser.

This is to be a dry reservoir (no permanent pool) but a drainage blanket with a toe drain is provided.

The flood routing procedure used in the design is described in Engineering Handbook, Section 5, Hydraulics, U. S. Department of Agriculture, Soil Conservation Service.

The flood routing procedure was used to determine the maximum stages shown in the table on the following page.

Factor Which Determines Stage	Surface Area Acres	Runoff in Inches	Peak In-flow CFS	Elev. of Maximum Stage Ft. <u>1/</u>	Storage Ac. Ft.	Element of Structure Determined by Maximum Stage
	--	--	--	192.5	---	Invert of Low Flow Orifice
	60	--	--	196.0	--	Crest of Riser
Project Storm (Prin. Spwy. Design)	137	12.00	2480	206.0	1096	Crest of Emergency Spillway
1.75 x 6 hr. point rainfall, moisture condition III (Emer. Spwy. Design)	154	15.84	5050	208.5	1460	Design Highwater
2.5 x 6 hr. point rainfall, moisture condition II (Freeboard Design)	159 169 <u>2/</u>	19.80 --	6700 --	209.2 <u>210.5</u>	1570 1775 <u>2/</u>	Top of Dam

1/ Referenced to Metropolitan District Datum

2/ Determined on the basis of State criteria requiring a minimum freeboard of two feet above design highwater elevation.

ANDERSON, NICHOLS & COMPANY

Subject Design of No. Branch
Park River Structure
Site 16.7 Cold Spring Dam

Sheet No. 5 of 5
Date 1-22-60
Computed M.A.
Checked GFC 3/8/60

Job No. C-1482

Hazard Classification

The dam site is located about 6 ± 7 miles upstream from the business center of Hartford, Connecticut. The area to be protected flood protection by the reservoir is well developed and includes a complex of residential, commercial and industrial properties.

These conditions, under Soil Conservation Service class definitions, place the structure as

Class C.

No. C-1482Basic Data For Hydrographs1. Soil-Cover Complex Numbers:

- a. For Principal Spillway Hydrograph, Moisture Condition III
Curve Number 86
- b. For Emergency Spillway Design Hydrograph, Soil Cons.
Service Criteria permit use of Moisture Condition III
with Curve No. 86. However, a letter from the
Connecticut Water Resources Commission, dated
April 30, 1959, to John J. Muzzochi specifies that
in determining this hydrograph the rate of retention
or total precipitation loss may not exceed 0.25 inches
per hour. In order to satisfy this specification
the Curve No. is raised to 88.
- c. For Emergency Spillway Freeboard Hydrograph,
Moisture Condition II, Curve No. 68

2. Time of Concentration

Channel Flow Reach 1: distance 2000 ft. slope 7%.

Velocity 7.0 fps

$$\text{Time} = \frac{2000}{7} = 286 \text{ Sec.}$$

Channel Flow Reach 2: distance 6000 ft. slope $S = 0.008$

$$\sqrt{S} = 0.09$$

Velocity = 4.9 fps

$$\text{Time} = \frac{6000}{4.9} = 1220 \text{ Sec}$$

Channel Flow Reach 3: distance 6000 ft. slope 0.0002

$$\sqrt{S} = 0.014$$

Velocity = 0.75 fps

$$\text{Time} = \frac{6000}{0.75} = 8000 \text{ Sec.}$$

Total Time = 9506 sec = 2.63 hrs.

Basic Data for Hydrographs Continued3. Storm Rainfall and Durationa. Principal Spillway HydrographPoint rainfall - 14.74 in.Areal rainfall - 13.78 in. —Duration - 19 hr.b. Emergency Spillway Design HydrographDuration 6 hr.

6 hr. point rainfall from SCS-NEH 4, Sup. A, Fig. 3.21, 1a, b.

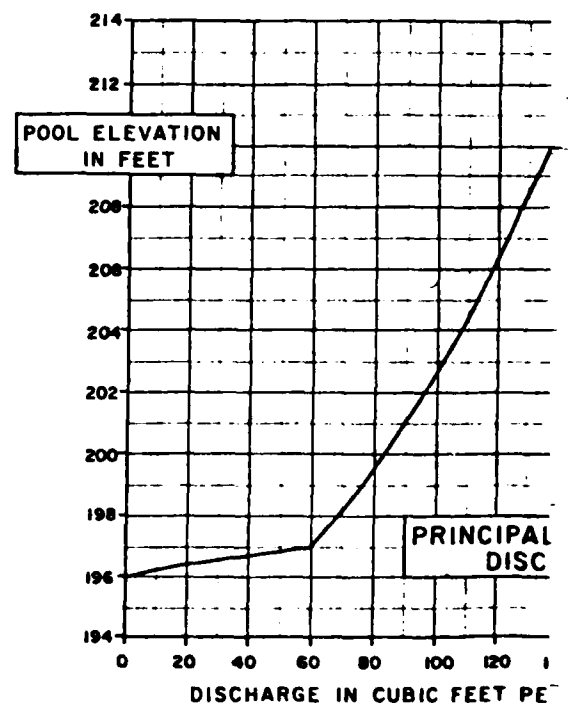
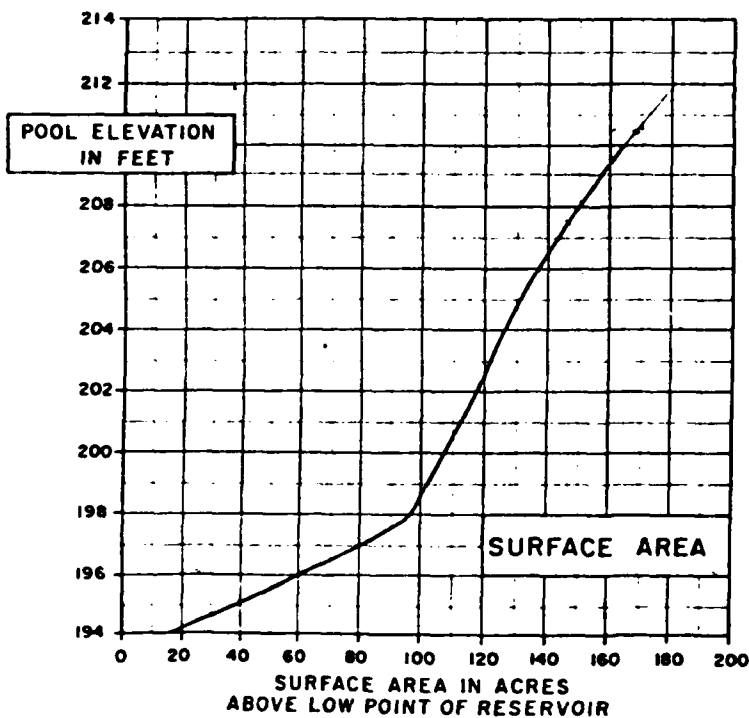
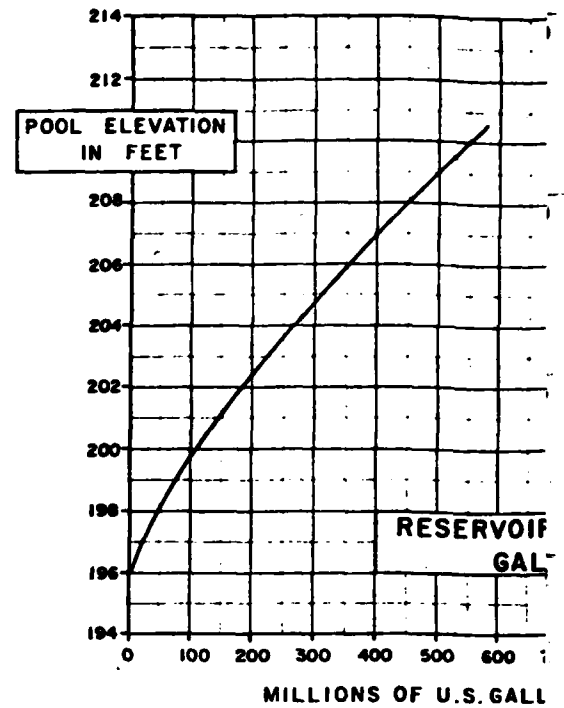
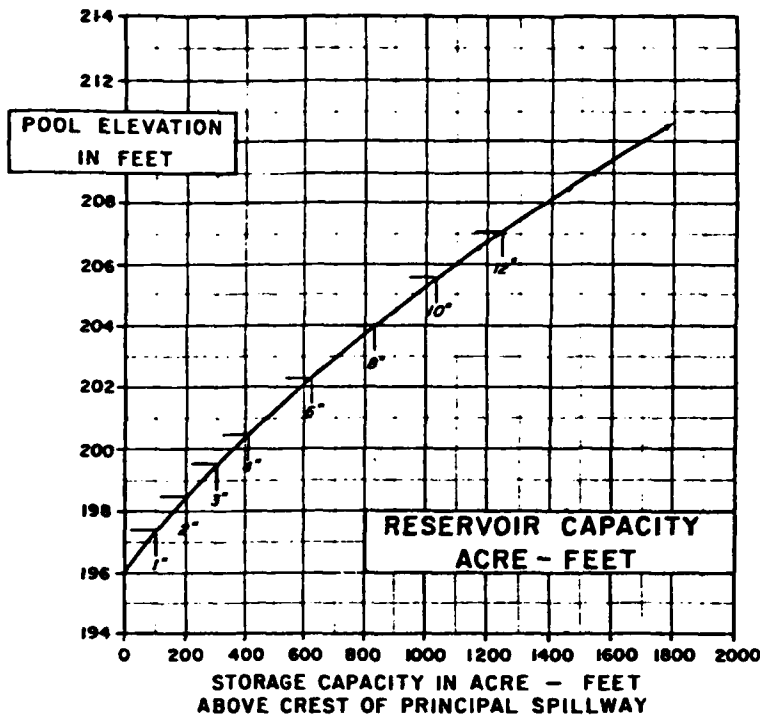
6 hr. rainfall for design = $1.75 \times 10.6 = 18.55$ in.Areal rainfall = $0.935 \times 18.55 = \underline{17.34}$ in.c. Emergency Spillway Freeboard HydrographDuration 6 hr.6 hr. point rainfall (same as above) = 10.6 in.6 hr. " " for hydrograph est. = $2.5 \times 10.6 = 26.5$ Areal rainfall = $0.935 \times 26.5 = \underline{24.78}$ in.Sediment Storage ComputationBasis - Rate of accumulation in reservoir 0.1 ton per acre
of drainage area per yearDr. area = $1.94 \text{ sq. mi.} = 1240 \text{ acres}$ 50 yr. acc. = $0.1 \times 1240 \times 50 = 6220 \text{ tons}$

Dry unit weight = 90 lb. per cu ft.

50 yr. acc. Volume = $\frac{6220 \times 2000}{90 \times 43,560} = \underline{3.16} \text{ ac. ft.}$
3,920,400

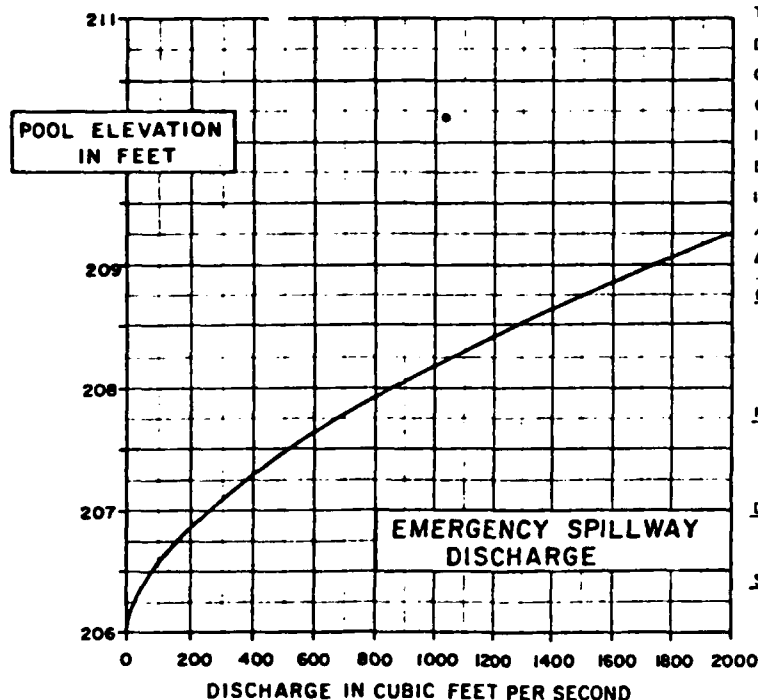
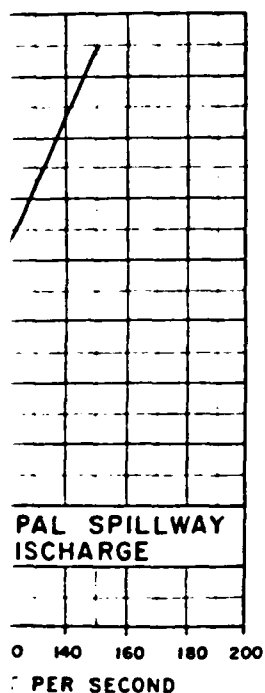
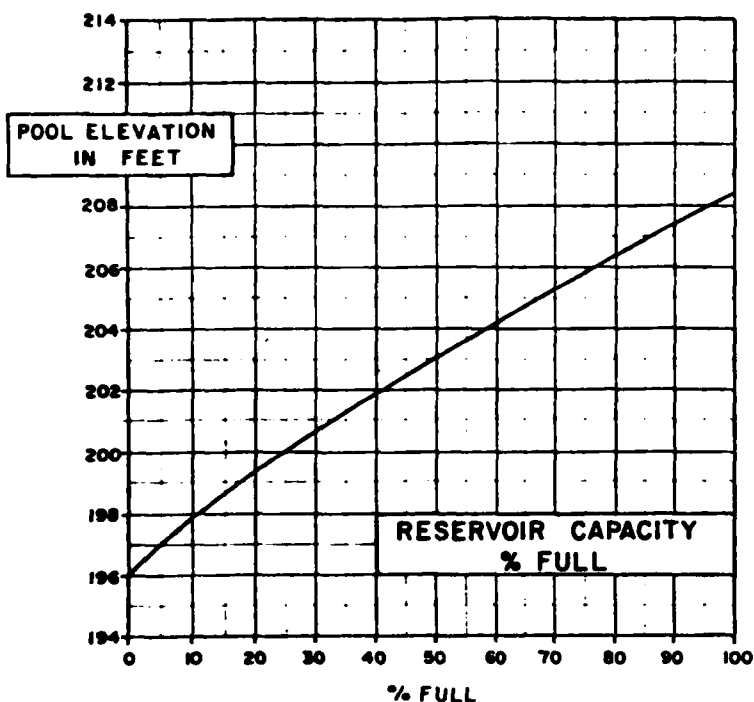
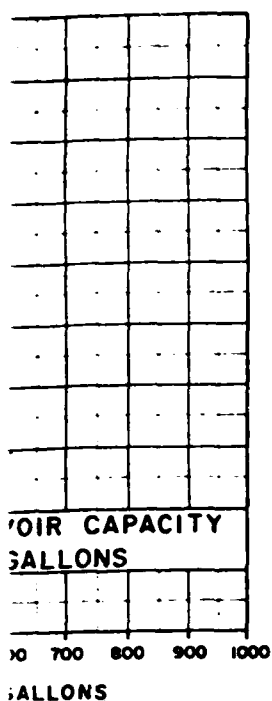
RESERVOIR OP

COLD SPRING RESERVOIR - TUMBLEDOWN BROOK -



PERATION DATA

- NORTH BRANCH PARK RIVER WATERSHED



PERTINENT DATA

TOP OF DAM EL. 210.5
 DESIGN HIGH WATER EL. 208.5
 CREST EMERGENCY SPILLWAY EL. 206.5
 CREST PRINCIPAL SPILLWAY EL. 196.0
 INVERT LOW FLOW ORIFICE EL. 192.5
 DRAINAGE AREA CONTROLLED 194.90 MI.
 1" OF RUNOFF = 10346 ACRE-Feet
 ALL ELEVATIONS REFER TO METROPOLITAN DISTRICT DATUM
 CONSTRUCTED BY:
 STATE OF CONNECTICUT
 DEPARTMENT OF AGRICULTURE & NATURAL RESOURCES
 JOSEPH N. GILL, COMMISSIONER
 IN ASSOCIATION WITH THE
 U.S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE
 PUBLIC LAW 566 FUNDS
 DESIGNED BY:
 ANDERSON - NICHOLS
 CONSULTING ENGINEERS
 STATUS:
 UNDER CONSTRUCTION

Anderson - Nichols Associates February 1967

2

WATER RESOURCES UNIT - D.C.P.

OPERATION AND MAINTENANCE INSPECTION REPORT

PROJECT: Bloomfield - Coldspring Reservoir

DATE: August 7, 1979

INSPECTION PARTY: A. Horwarth, Soil Conservation Service; and A. Roberts,
V. Galgowski, Department of Environmental Protection

ITEM	CONDITION S or U*	MAINTENANCE OR REPAIRS REQUIRED	DATE COMPLETED
I. Embankments			
A. Vegetation	S	Mow grass	
B. Rip rap	S		
C. Drains	S		
II. Principal Spillway			
A. Trash rack	S		
B. Gates	S		
C. Stilling basin	S		
D. Conduit	S		
III. Emergency Spillway			
A. Vegetation	S	Mow grass	
B. Obstructions	U		
IV. Outlet Channels			
A. Slope protection	S		
B. Debris	S		
V. Reservoir Area			
A. Debris	S		
B. Stop logs	N/A		
VI. Miscellaneous			
A. Access road	S		
B. Fences	S		

Remarks: Unauthorized fill dumped in emergency spillway should be removed.

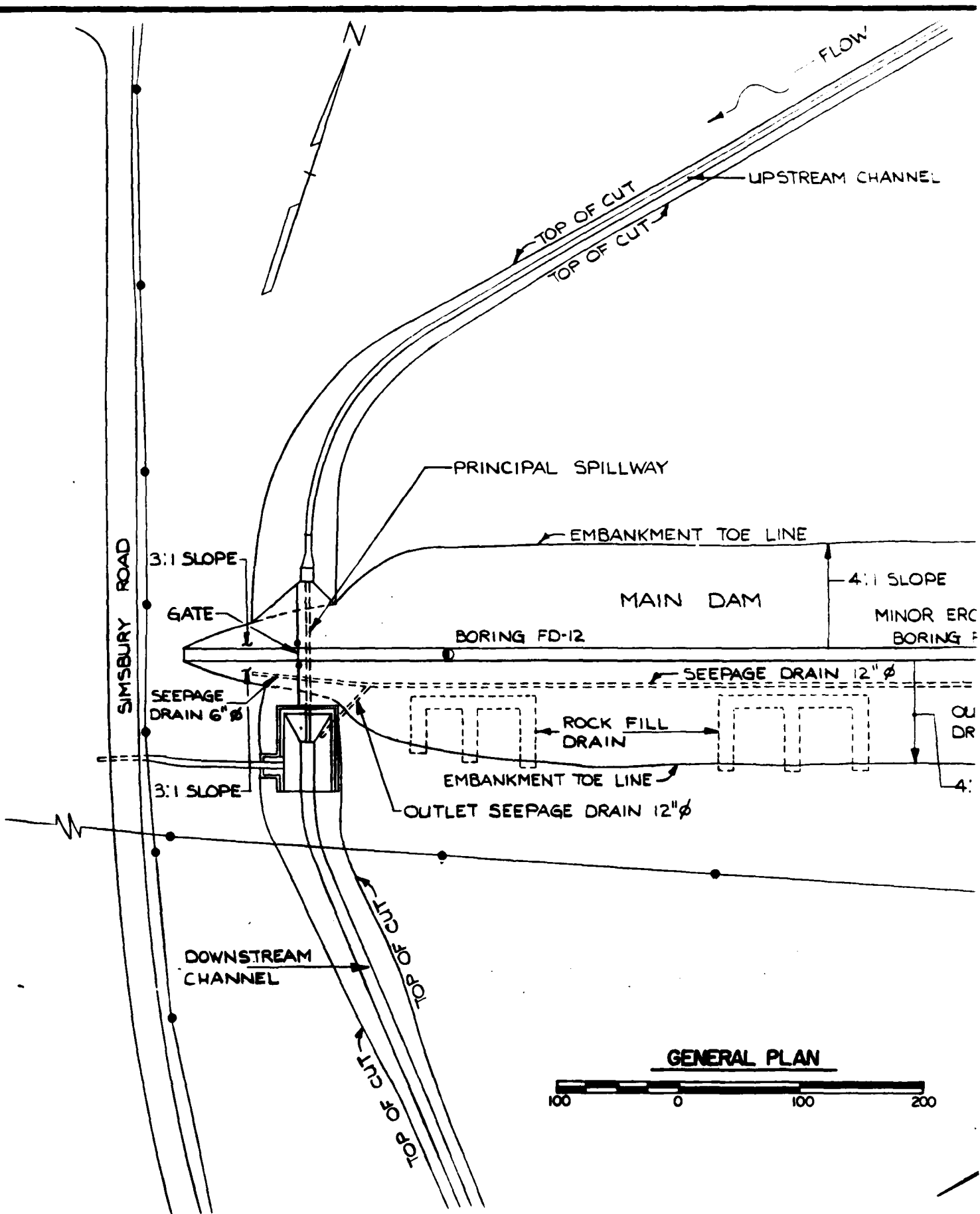
Eventually, cattail growth in channel in vicinity of the intake structure will have to be removed in order to prevent plugging of conduit.

Inspected by: Victor F. Galgowski Title Supt. of Dam Maintenance

* S = Satisfactory
U = Unsatisfactory
N/A = Not applicable

BIBLIOGRAPHY

1. "Recommended Guildelines for Safety Inspection of Dams", Department of the Army, Office of the Chief Engineers, Washington, D.C. 20314, 1979.
2. Design of Small Dams, Revised Reprint, United States Department of the Interior, Bureau of Reclamation, United States Government Printing Office, Washington, D.C. 1977.
3. Soil Survey, Hartford County, Connecticut, United States Department of Agriculture, U.S. Government Printing Office, Washington 25, D.C. 1962
4. Donald M. Gray: Handbook on the Principles of Hydrology, Water Information Center, 1970.
5. Hunter Rouse: Engineering Hydraulics, John Wiley and Sons, New York, 1950.
6. Victor L. Streeter: Fluid Mechanics, McGraw-Hill Book Company, Inc. 1958.
7. S.C.S. National Engineering Handbook, Hydrology Section 4, Soil Conservation Service, U.S. Department of Agriculture, 1972.
8. "North Branch Park River Watershed Protection Project Design Report, Site Nol 9 (Cold Spring Reservoir Dam) " Bloomfield, Conn., Anderson-Nichols, Consulting Engineers, Boston/Hartford, 1960



GENERAL PLAN



ANNEL

FARMINGTON RIVER
POWER CO.

BORING
FD-7

SLOPE

MINOR EROSION

BORING FD-2

TWO
LOWSPOTS

3:1 SLOPE

OUTLET SEEPAGE
DRAIN 12" ϕ

SEEPAGE
DRAIN 6" ϕ

4:1 SLOPE

DIKE

TOP OF CUT

EMERGENCY
SPILLWAY

CONTROL SECTION

TOP OF CUT

FLOW

REFERENCE:

DESIGN DRAWINGS SUPPLIED BY
U.S. SOIL CONSERVATION SERVICE
MANSFIELD, CONN.

GOODKIND & O'DEA INC.-
SINGHAL ASSOCIATES, INC.
ENGINEERS

U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

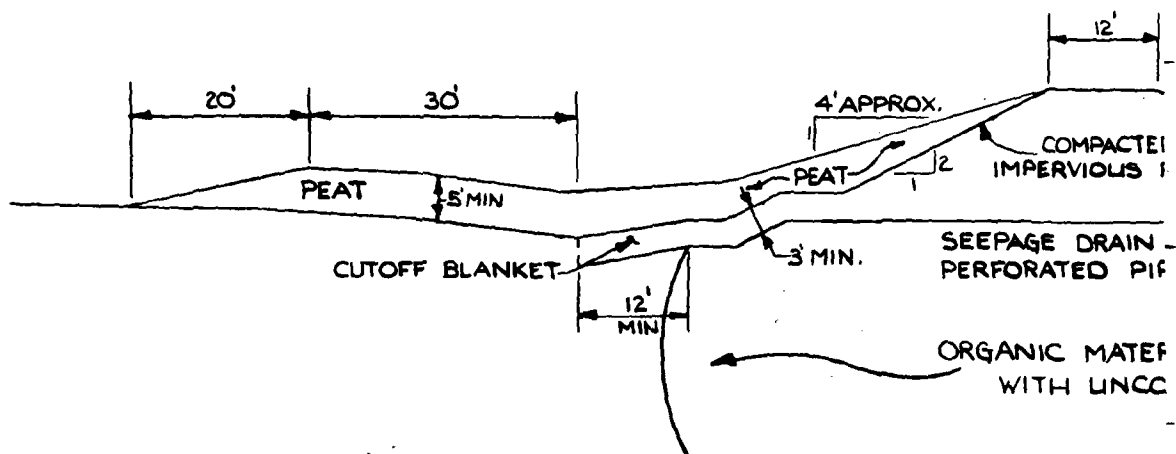
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

GENERAL PLAN

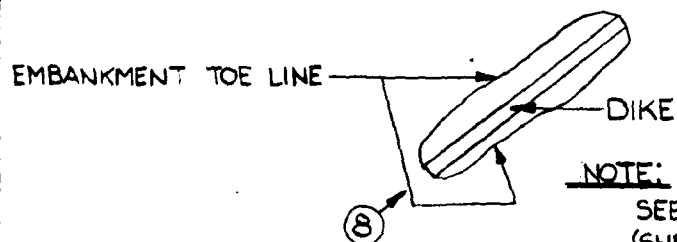
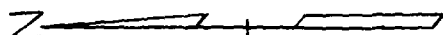
COLD SPRING RESERVOIR DAM
BLOOMFIELD, CONNECTICUT

DRAWN BY	CHECKED BY	APPROVED BY	SCALE: AS NOTED
E.T.R.	W.J.W.	L.J.B.	DATE: MAY, 1981 SHEET 8-1

(2)



TYPICAL

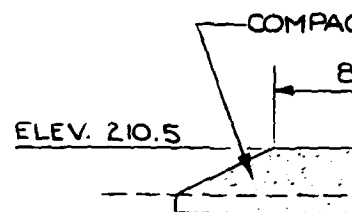


PLAN OF DIKE



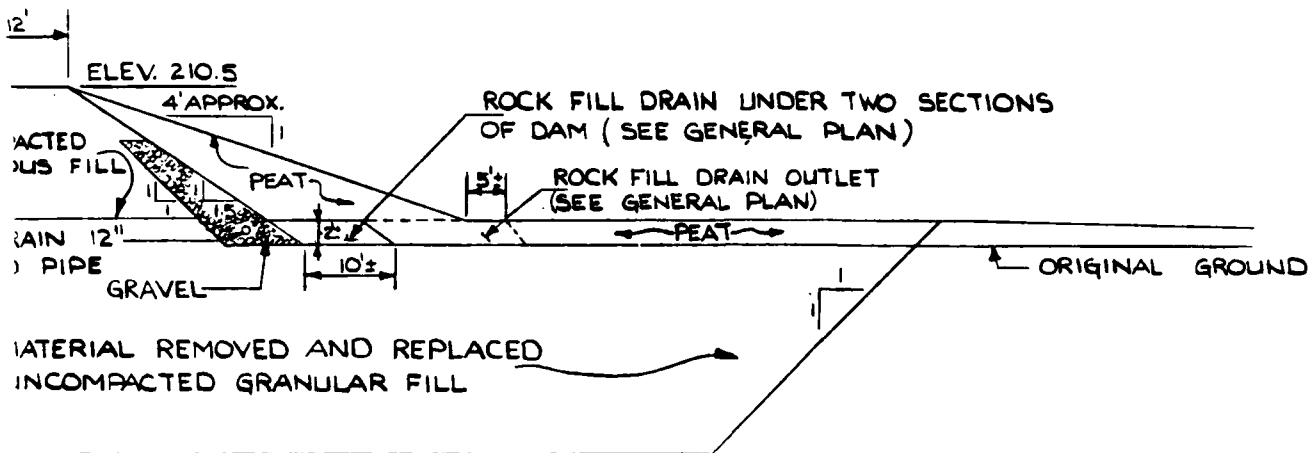
NOTE:

SEE LOCATION PLAN
(SHEET-2) FOR
LOCATION OF DIKE

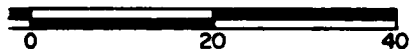


TYPICAL SECT

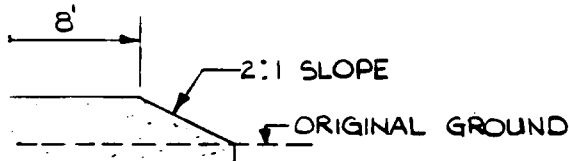




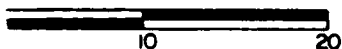
CROSS SECTION OF DAM



CROSS SECTION OF DIKE



CROSS SECTION OF DIKE



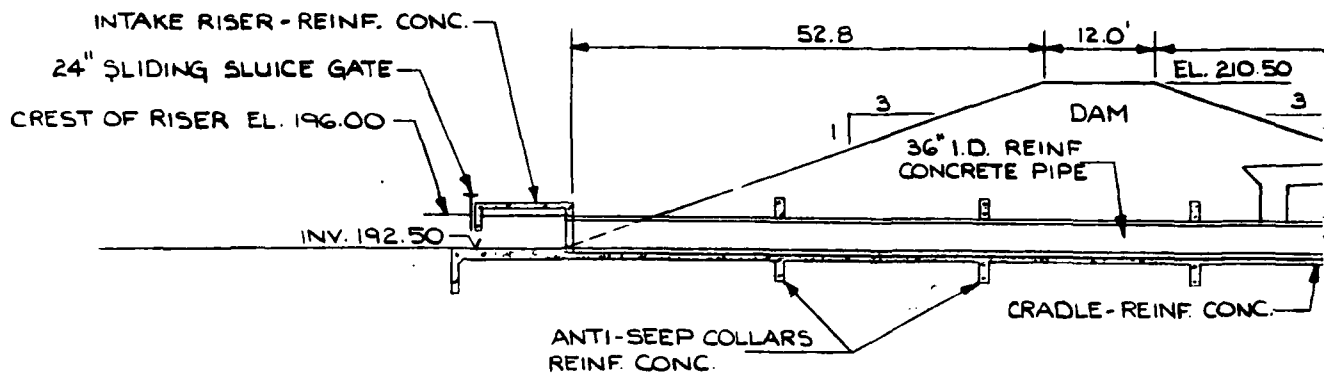
NOTE:

ALL ELEVATIONS REFERENCED TO METROPOLITAN DISTRICT DATUM.

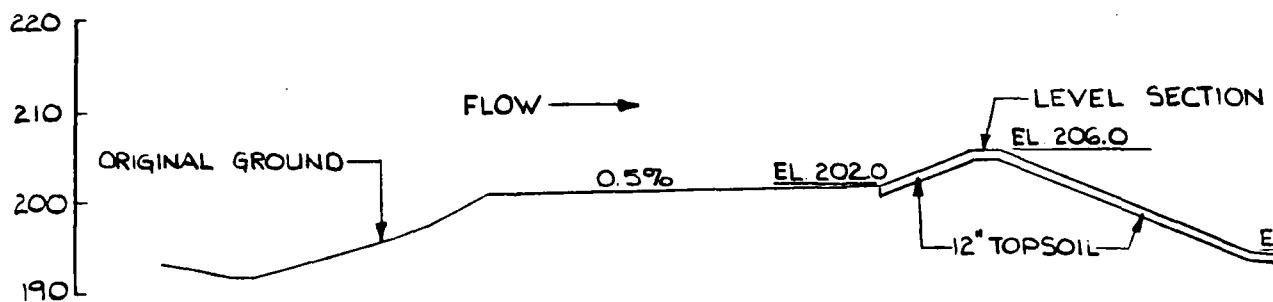
REFERENCE:

DESIGN DRAWINGS SUPPLIED BY U.S. SOIL CONSERVATION SERVICE MANSFIELD, CONN.

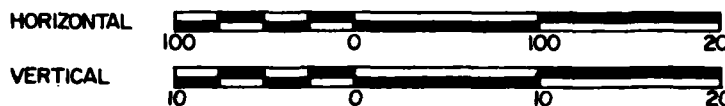
GOODKIND & O'DEA INC.— SINGHAL ASSOCIATES (INC.) ENGINEERS	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.		
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS			
PLAN AND SECTION OF DIKE & TYP. SECTION OF DAM			
COLD SPRING RESERVOIR DAM			
BLOOMFIELD, CONNECTICUT			
DRAWN BY	CHECKED BY	APPROVED BY	SCALE: AS NOTED
E.T.K.	W.J.W.	L.J.B.	DATE: MAY, 1981 SHEET B-2



PROFILE ALONG ϕ OF PRINCIP

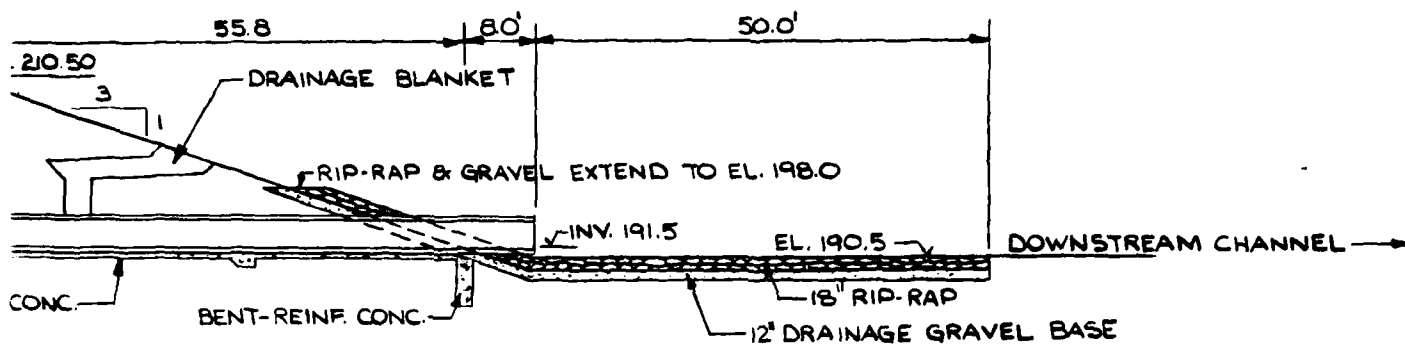


PROFILE ALONG ϕ OF EMERGENCY SPILLWAY

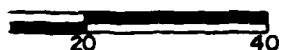


N

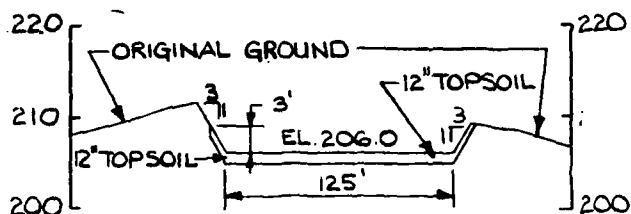
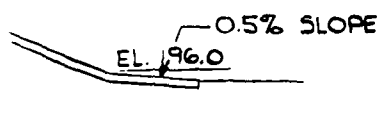
R



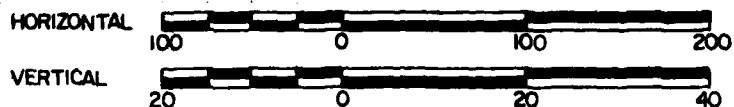
PRINCIPAL SPILLWAY



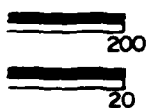
SECTION



TYPICAL SECTION OF EMERGENCY SPILLWAY



SPILLWAY



NOTE:

ALL ELEVATIONS REFERENCED TO METROPOLITAN DISTRICT DATUM.

REFERENCE:

DESIGN DRAWINGS SUPPLIED BY U.S. SOIL CONSERVATION SERVICE MANSFIELD, CONN.

GOODKIND & O'DEA INC.-
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ENGINEERS

U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS
PROFILES OF PRINCIPAL & EMERGENCY SPILLWAY

COLD SPRING RESERVOIR DAM
BLOOMFIELD, CONNECTICUT

DRAWN BY CHECKED BY APPROVED BY SCALE: AS NOTED

ETK

W&W

L.J.B.

DATE: MAY, 1981

SHEET 8-3

2

FD-2

10-17-58

EI. 193±

0.0

2.0

7.0

12.0

18.8

21.0

27.5

Soft, black, organic
SILT & PEAT OH-PT.

Very soft, red-brown,
fibrous PEAT

Pt

Very soft, yellow-
brown PEAT

Pt

Very soft, yellow-
gray organic SILT
(Resembles
Diatomaceous
Earth) OH.

Medium dense, red-
brown sandy GRAVEL
little silt. GM

Med. dense to dense
red-brown, gravelly.
sandy SILT - non-
plastic (Glacial till)
ML

FD-7

2-1-60

EI 208.6

0.0

1.0

3.0

13.0

21.5

Brown, sandy TOPSOIL SM

Loose, red-brown gravelly
silty fine SAND SM

Dense to very dense,
red-brown, silty
gravelly SAND,
Matrix very slightly
plastic
(Glacial till)
SM

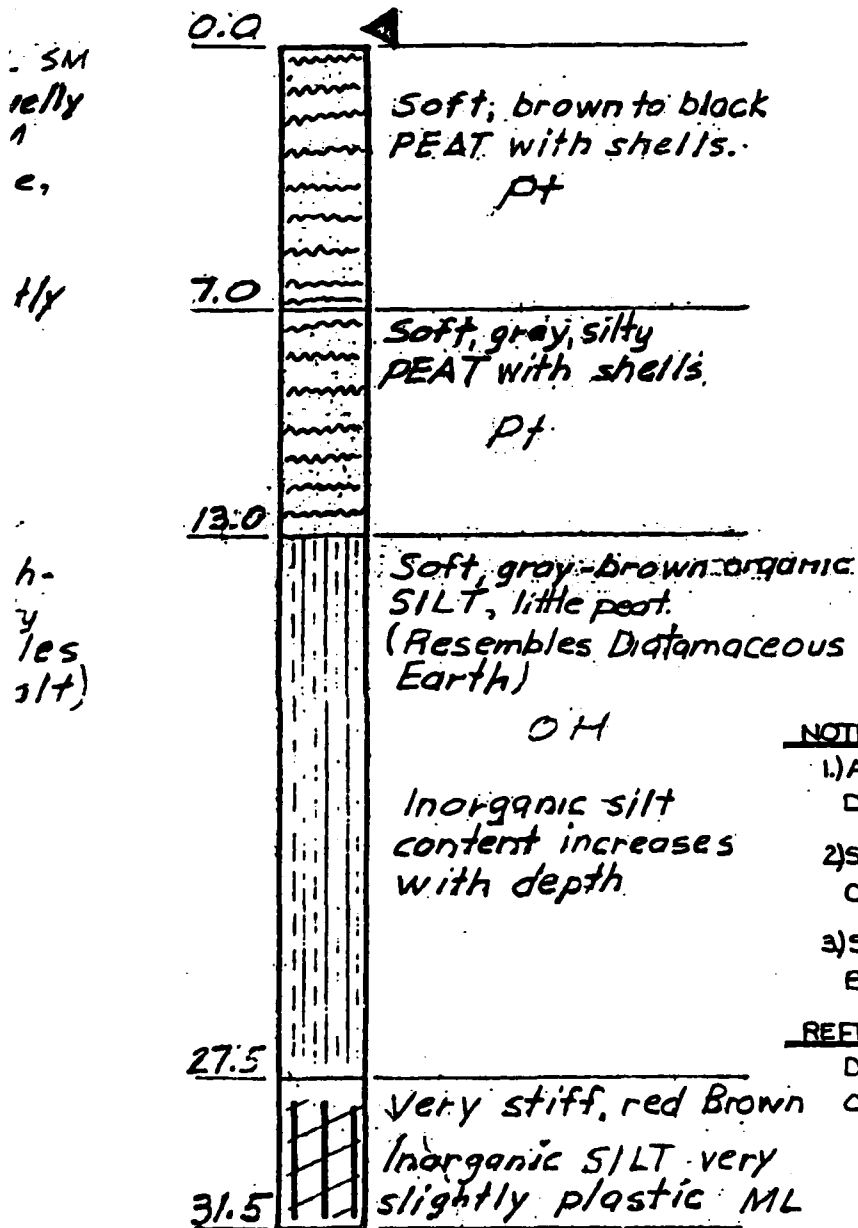
Very dense, greenish-
gray, gravelly, silty
SAND - few cobbles
(Weathered Basalt)

SM

FD-12

2-9-60

El. 194±



NOTES:

- 1.) ALL ELEVATIONS REFERENCED TO METROPOLITAN DISTRICT DATUM.
- 2.) SEE SHEET B-1 "GENERAL PLAN" FOR LOCATION OF BORINGS.
- 3.) SEE DESIGN DRAWINGS FOR ADDITIONAL BORINGS.

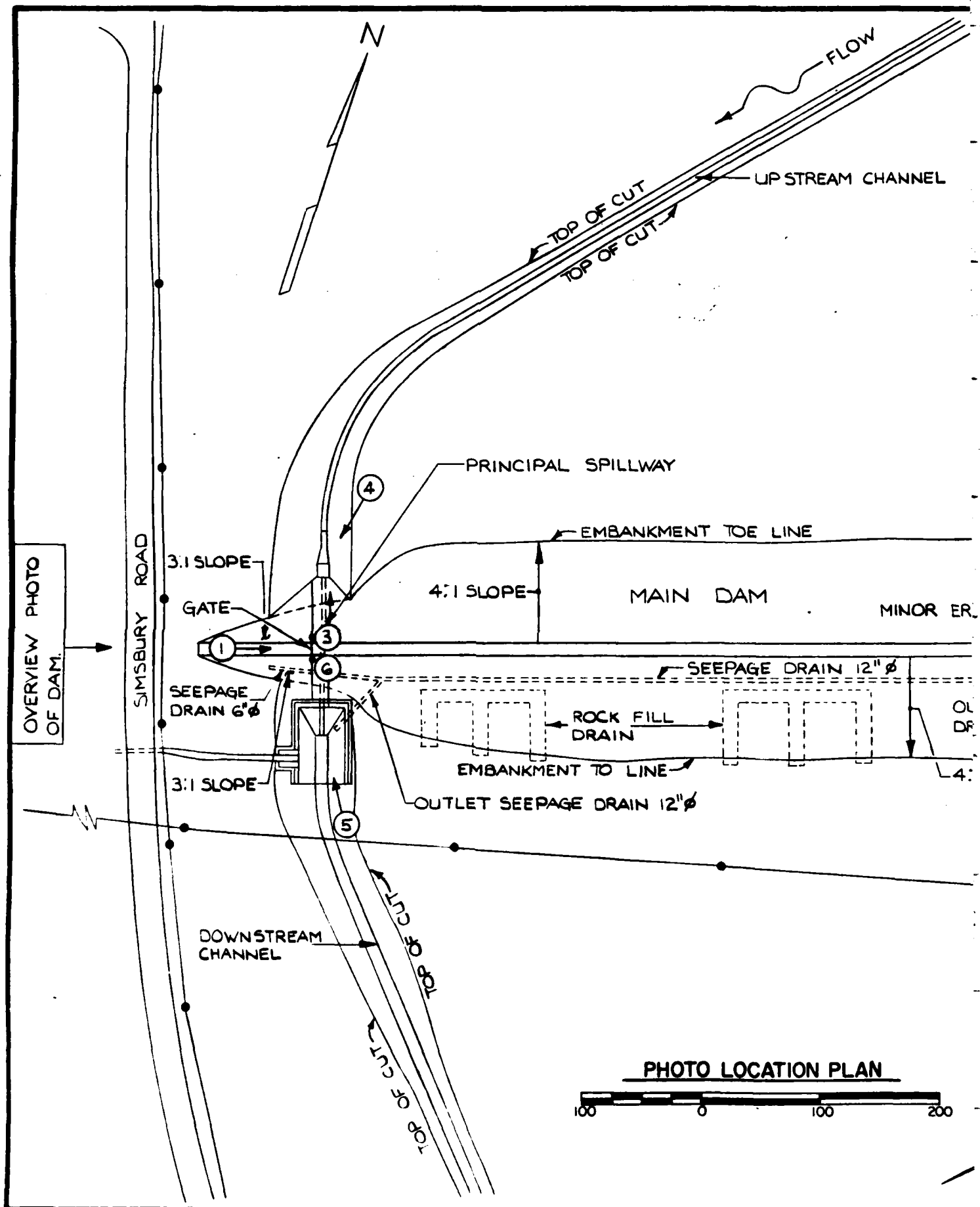
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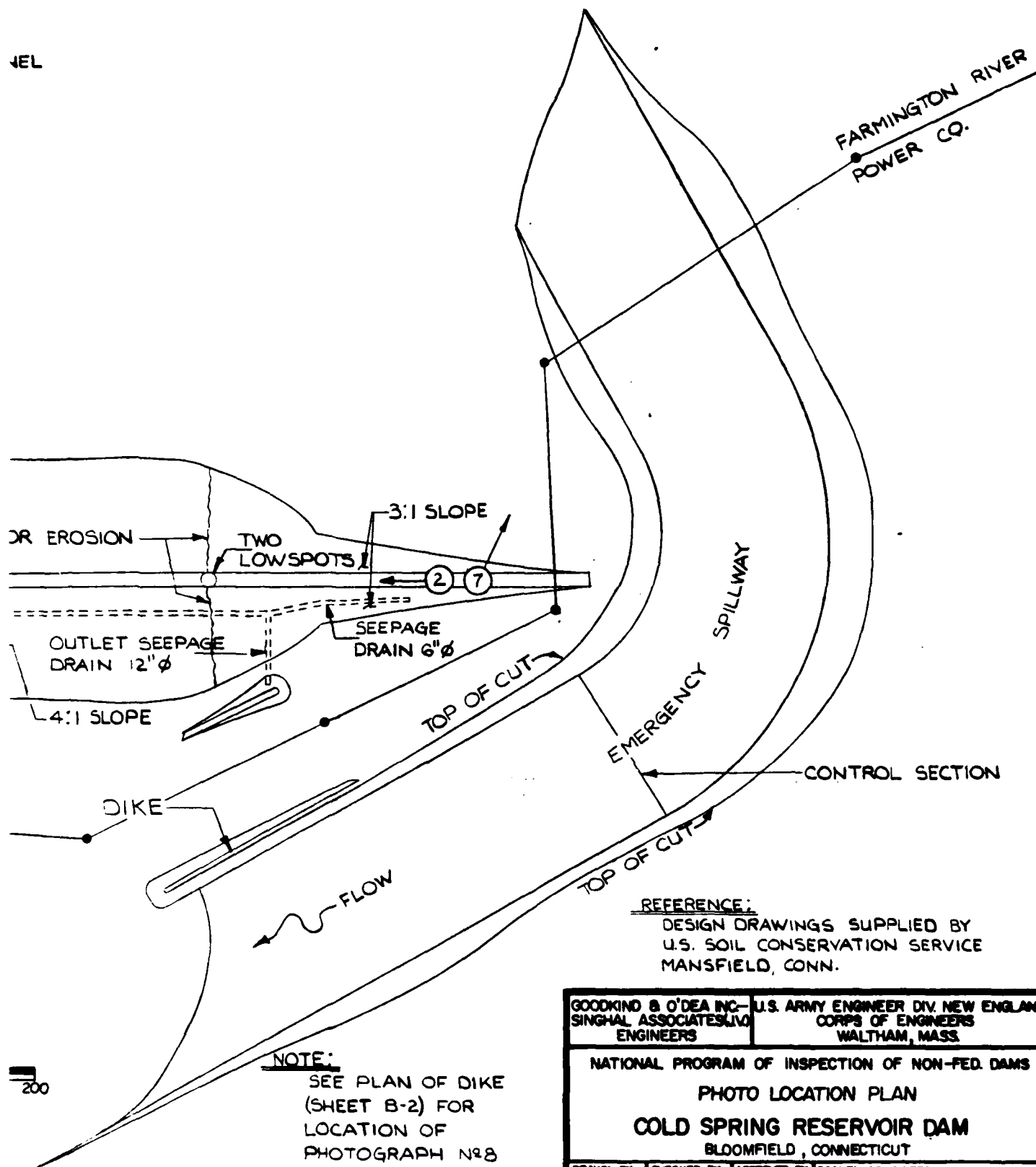
GOODKIND & O'DEA INC.- SINGHAL ASSOCIATES LTD ENGINEERS		U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS TYPICAL BORINGS			
COLD SPRING RESERVOIR DAM BLOOMFIELD, CONNECTICUT			
DRAWN BY E.T.R.	CHECKED BY W.J.W.	APPROVED BY L.A.B.	SCALE: NONE DATE: MAY, 1981 SHEET B-4

APPENDIX C

DETAIL PHOTOGRAPHS



4EL



REFERENCE:

DESIGN DRAWINGS SUPPLIED BY
U.S. SOIL CONSERVATION SERVICE
MANSFIELD, CONN.

NOTE:

SEE PLAN OF DIKE
(SHEET B-2) FOR
LOCATION OF
PHOTOGRAPH N28

GOODKIND & O'DEA INC. SINGHAL ASSOCIATES/INC. ENGINEERS		U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS			
PHOTO LOCATION PLAN			
COLD SPRING RESERVOIR DAM			
BLOOMFIELD, CONNECTICUT			
DRAWN BY	CHECKED BY	APPROVED BY	SCALE: AS NOTED
E.T.K.	W.J.W.	L.J.B.	DATE: MAY, 1981 SHEET C-1

(2)

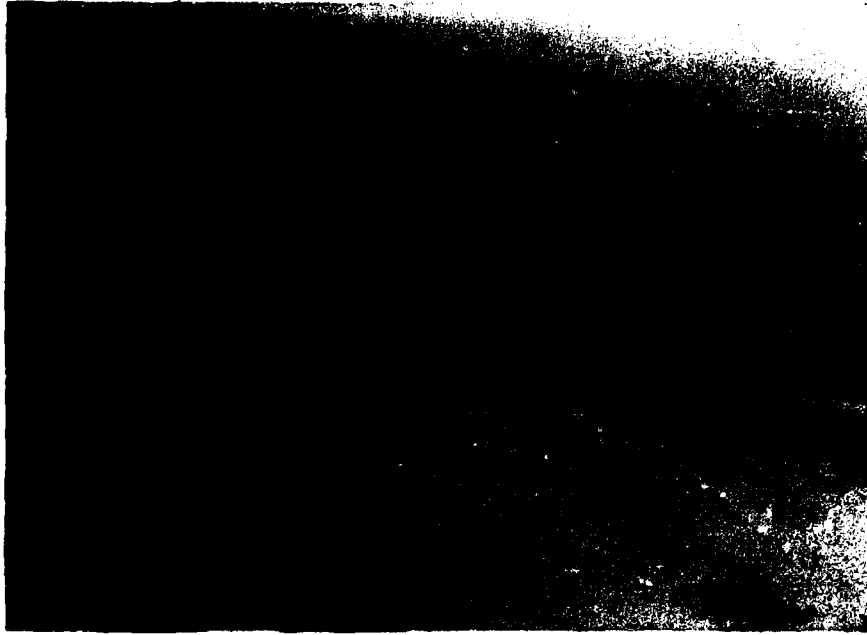


PHOTO 1 - View looking east along
top of dam embankment.



PHOTO 2 - View looking west along
top of dam embankment



PHOTO 3 - Upstream Channel.



PHOTO 4 - Intake Riser - Slide Gate open. Gate stem bent and gate handle missing.

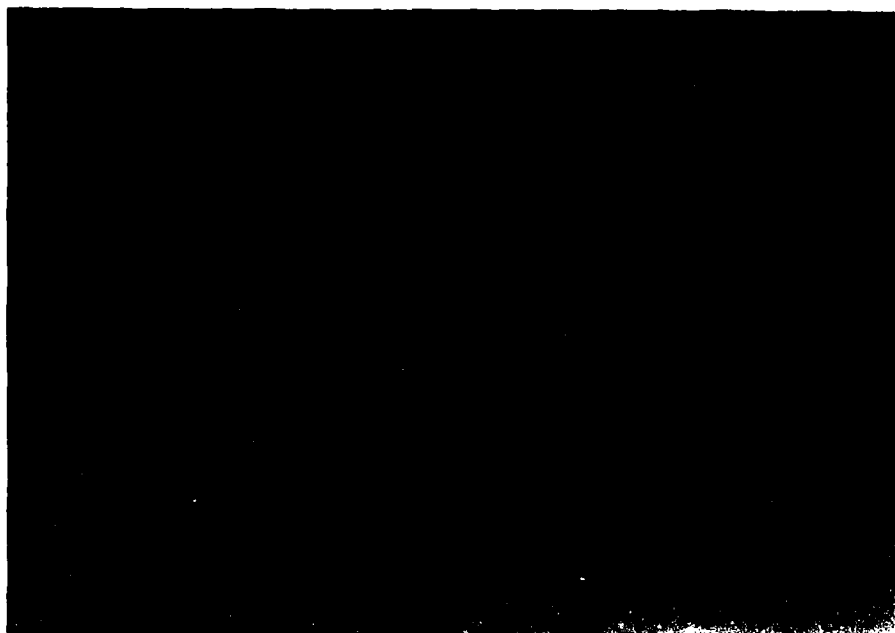


PHOTO 5 - Principal Spillway
Outlet Pipe



PHOTO 6 - Downstream Channel. Note
minor channel obstructions.



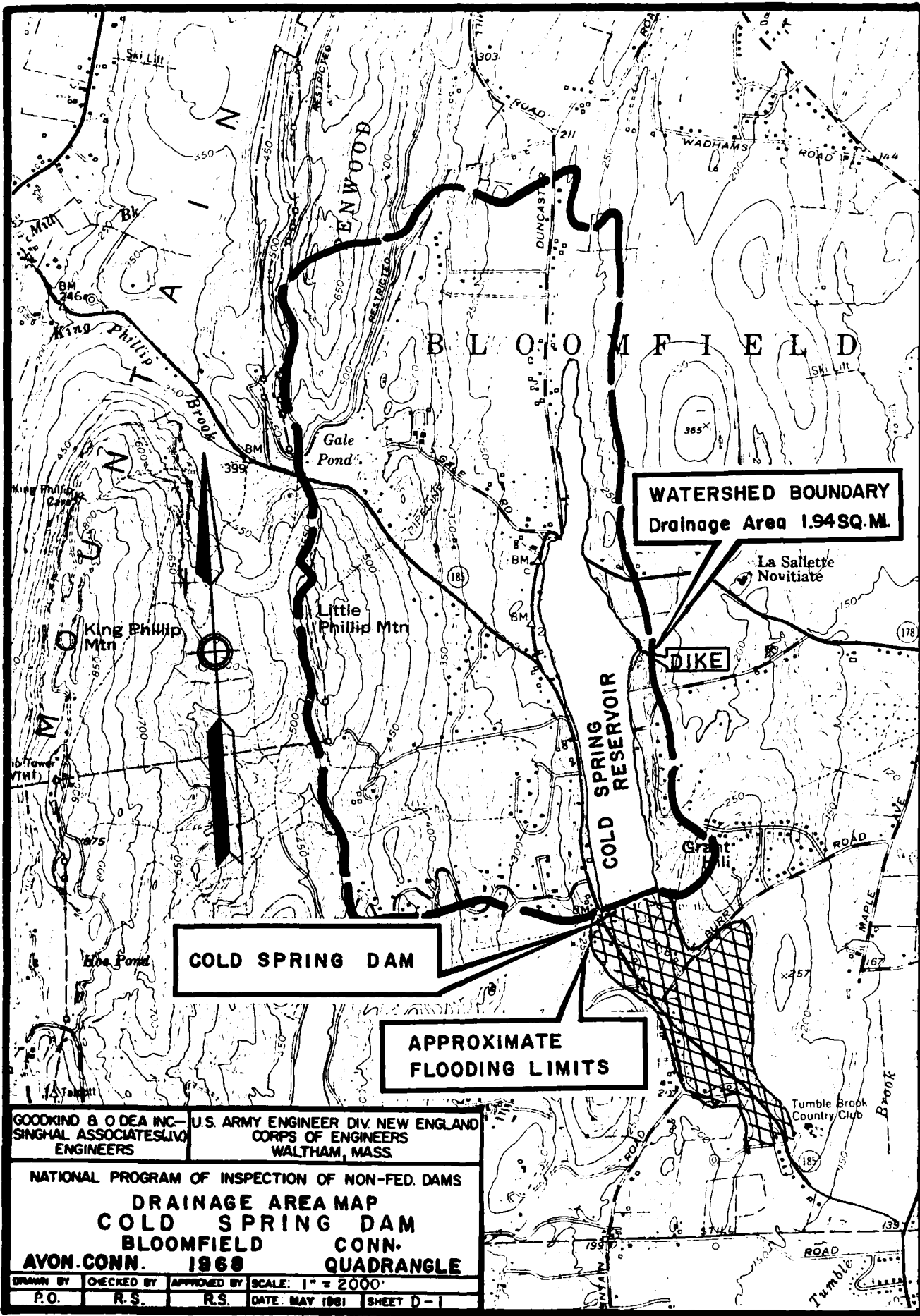
PHOTO 7 - View looking at inlet end
of emergency spillway.
Note vehicle use.



PHOTO 8 - View looking south along
minor dike.

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS



SINGHAL ASSOCIATES

CONSULTING ENGINEERS

(CIVIL, HYDRAULICS, SANITARY)

827 MAPLEDALE ROAD, ORANGE, CT 06477

TEL: (203) 795-6562

Job COLD SPRING DAM

Sheet Number D-1

Date 12.20.1986

By R.S. / G.H.

TEST FLOOD FLOWS AND HAZARD CLASSIFICATION

DRAINAGE AREA = 1.94 Sq. Miles

THE DRAINAGE AREA CAN BE CONSIDERED AS LYING BETWEEN THE 'FLAT & COASTAL' AND 'ROLLING' CATEGORIES. ASSUMING A FACTOR OF $950 + \frac{1}{3}(2150 - 950) = 1350$ FROM THE CORPS OF ENGINEER CHART,

$$PMF = 1350 \times 1.94$$

$$= 2,620 \text{ C.F.S.}$$

SIZE & HAZARD CLASSIFICATION

MAX. HEIGHT OF THE DAM = 20.0'

MAX. IMPOUNDMENT UPTO TOP OF DAM = 1760 AC FT.

ALTHOUGH THE HEIGHT OF THE DAM IS 225 FT., THE STORAGE EXCEEDS 1000 AC-FT, HENCE,

THE SIZE OF THE DAM = 'INTERMEDIATE'.

THE HAZARD POTENTIAL IS 'HIGH' DUE TO THE EXISTENCE ON THE DOWNSTREAM SIDE OF SEVERAL IMPORTANT ROADS INCLUDING STATE ROUTES #185 AND 218 AND A LARGE NUMBER OF HOUSES AND OTHER BUILDINGS. MANY OF THESE WILL BE FLOODED IN THE EVENT OF DAM FAILURE. THERE MAY BE 'MORE THAN FEW' LOSS OF LIVES

AS PER TABLE 3 PAGE D-II OF THE RECOMMENDED GUIDELINES FOR SAFETY INSPECTION OF DAMS, THE RECOMMENDED

$$\underline{\text{DESIGN FLOOD} = PMF = 2620 \text{ C.F.S.}}$$

SINGHAL ASSOCIATES**CONSULTING ENGINEERS**

(CIVIL, HYDRAULICS, SANITARY)

827 MAPLEDALE ROAD, ORANGE, CT 06477

TEL: (203) 795-6562

Job COLD SPRING DAMSheet Number D-2Date 12-22-1980By R. S. / G. H.SPILLWAY CAPACITY

THE SPILLWAY CONSISTS OF THE FOLLOWING :-

1- 36" RCP (PIPE INV. 192.5, WEIR INV. 196.0)

1- EMERGENCY SPILLWAY 125 FT. AT THE
CONTROL SECTION WITH CREST ELEV. 206.0THE CAPACITIES OF THE SPILLWAYS AT VARIOUS
ELEVATIONS ARE TABULATED BELOW:

ELEV.	CAPACITY - C.F.S.		
	PRINCIPAL SPILLWAY	EMERGENCY SPILLWAY $Q = 3.0 \text{ LH}^{3/2}$	TOTAL
196.0	0.0	0.0	0.0
197.0	60.0	0.0	60.0
198.0	70.0	0.0	70.0
199.0	76.0	0.0	76.0
200.0	83.0	0.0	83.0
201.0	90.0	0.0	90.0
202.0	96.0	0.0	96.0
203.0	102.0	0.0	102.0
204.0	108.0	0.0	108.0
205.0	113.0	0.0	113.0
206.0	118.0	0.0	118.0
207.0	123.0	375.0	498.0
208.0	128.0	1061.0	1189.0
209.0	133.0	1949.0	2082.0
210.0	138.0	3000.0	3138.0
210.5	140.0	3580.0	3720.0

SINGHAL ASSOCIATES

CONSULTING ENGINEERS

(CIVIL, HYDRAULICS, SANITARY)

827 MAPLEDALE ROAD, ORANGE, CT 06477

TEL: (203) 795-6562

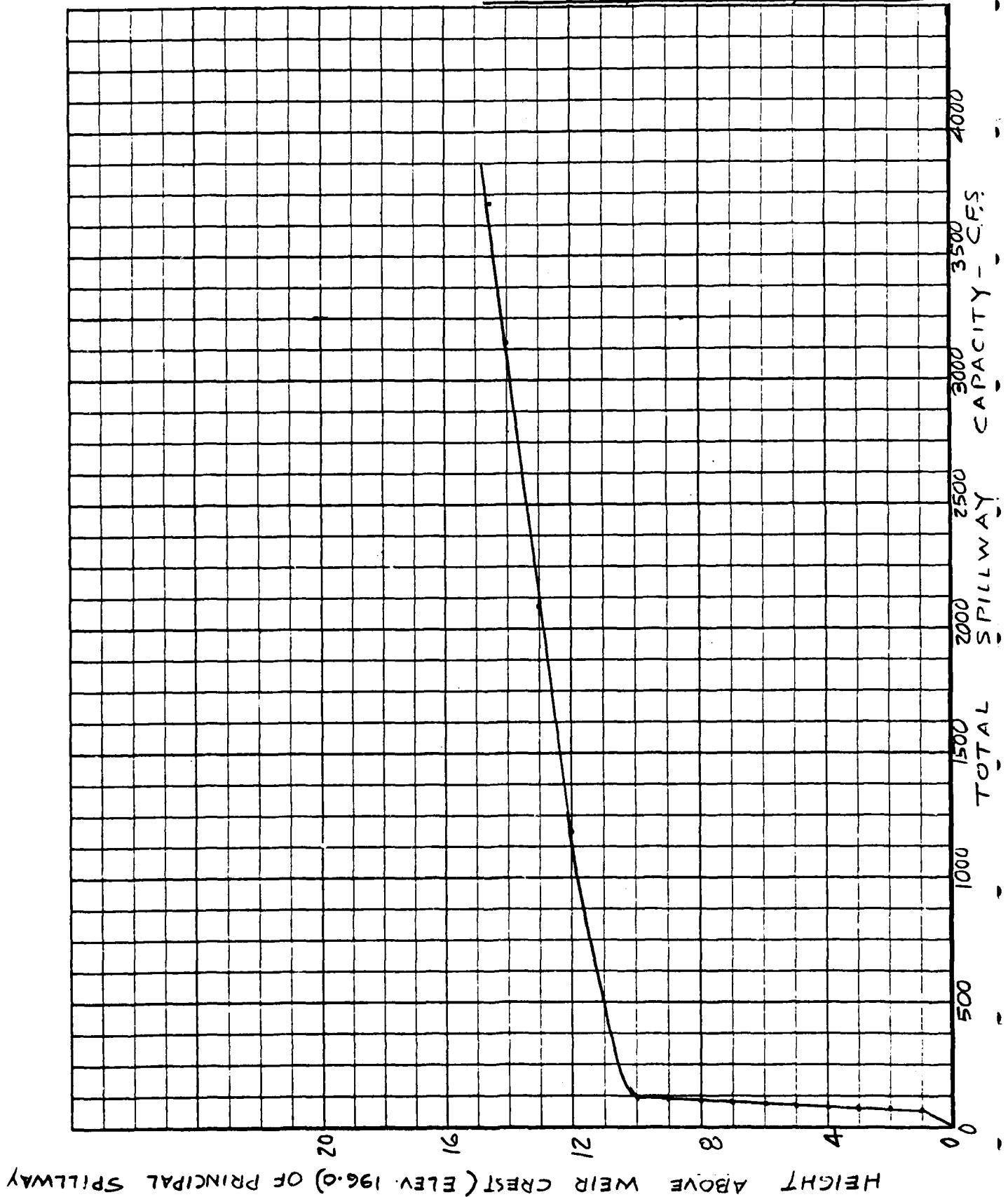
Job COLD SPRING DAM

Sheet Number D-3

Date 12-22-1980

By R-S/G.H.

SPILLWAY CAPACITY CURVE



SINGHAL ASSOCIATES**CONSULTING ENGINEERS****(CIVIL, HYDRAULICS, SANITARY)**

827 MAPLEDALE ROAD, ORANGE, CT 06477

TEL: (203) 795-6562

Job COLD SPRING DAMSheet Number D-4Date 12.24.1980By R. S. / G. H.WATER SURFACE AREAS AND
SURCHARGE STORAGES

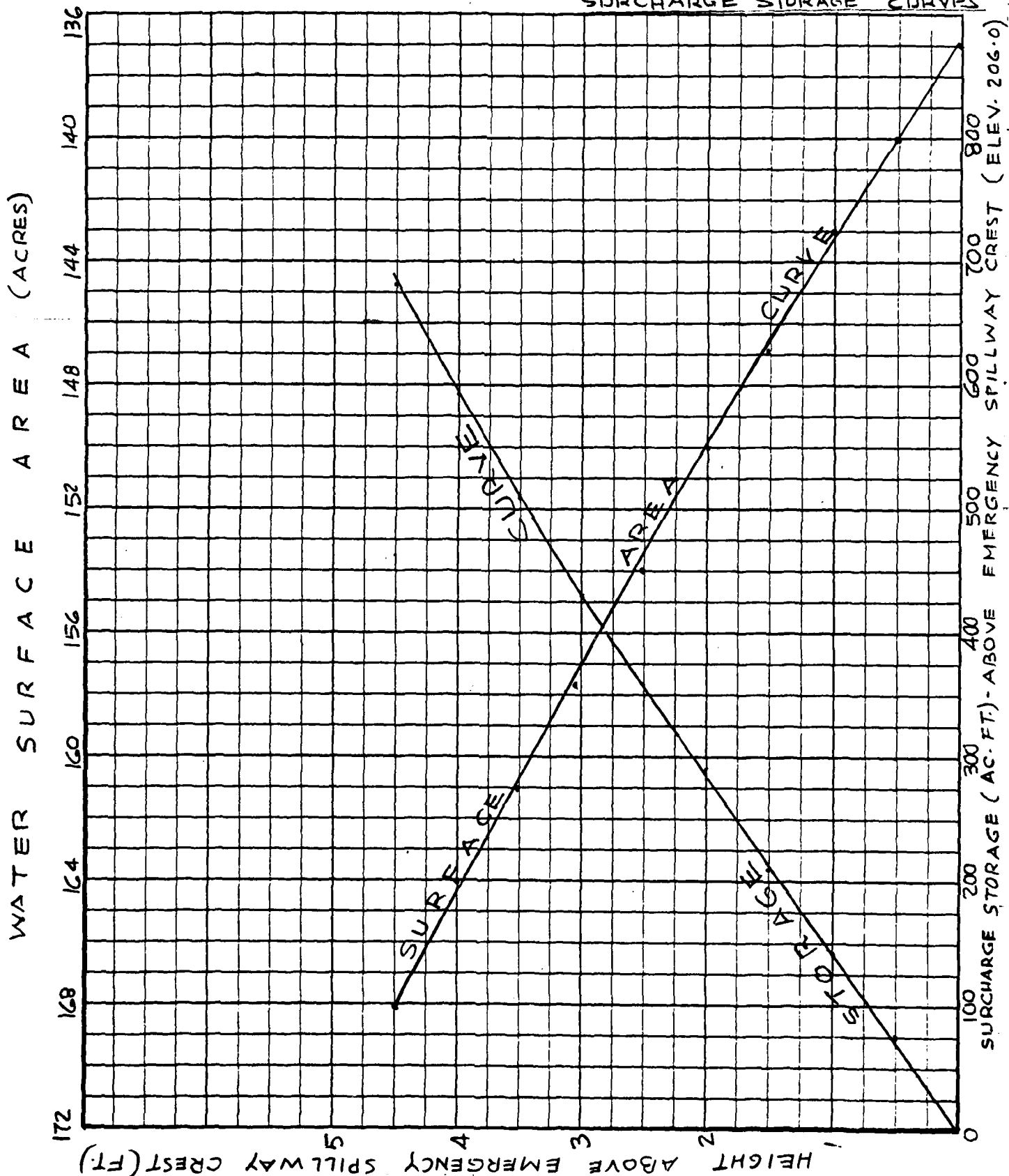
RESERVOIR WATER ELEVATION	HEIGHT ABOVE EMERGENCY SPILLWAY CREST. (FT.)	WATER SURFACE AREA (ACRES)	SURCHARGE STORAGE CAPACITY (AC-FT.)
206.0	0.0	137.0	0.0
206.5	0.5	140.0	75.0
207.0	1.0	143.0	140.0
207.5	1.5	147.0	210.0
208.0	2.0	150.0	290.0
208.5	2.5	154.0	360.0
209.0	3.0	158.0	430.0
209.5	3.5	161.0	510.0
210.0	4.0	164.0	595.0
210.5	4.5	168.0	660.0

SINGHAL ASSOCIATES
CONSULTING ENGINEERS
 (CIVIL, HYDRAULICS, SANITARY)

827 MAPLEDALE ROAD, ORANGE, CT 06477
 TEL: (203) 795-6562

Job COLD SPRING DAM
 Sheet Number D-5
 Date 12-7-6-1981
 By R.S./G.H.

RESERVOIR SURFACE AREA AND
SURCHARGE STORAGE CURVES



SINGHAL ASSOCIATES**CONSULTING ENGINEERS**

(CIVIL, HYDRAULICS, SANITARY)

827 MAPLEDALE ROAD, ORANGE, CT 06477

TEL: (203) 795-6562

Job COLD SPRING DAMSheet Number D-6Date 12.26.1980By R.S / G.H.INFLOW FLOOD HYDROGRAPH

TEST FLOOD = 2620 C.F.S. (P.M.F.)

DRAINAGE AREA = 1.94 SQ. MILES.

AS PER 'HYDROLOGY SECTION 4, S.C.S. NATIONAL ENGINEERING HANDBOOK':

$$q_p = \frac{484 \cdot A \cdot Q}{T_p}$$

$$\text{AND } T_b = 2.67 T_p.$$

WHERE T_b = TIME BASE OF HYDROGRAPH IN HOURS T_p = TIME IN HOURS FROM START OF RISE OF HYDROGRAPH TO ATTAINMENT OF PEAK q_p = PEAK RATE OF RUNOFF IN C.F.S.

A = DRAINAGE AREA IN SQ. MILES

Q = TOTAL VOLUME OF RUNOFF IN INCHES

SUBSTITUTING THE KNOWN VALUES OF A, Q AND q_p :

$$2620 = \frac{484 \times 1.94 \times 19}{T_p}$$

FROM WHICH

$$T_p = 6.8 \text{ HOURS}$$

$$\begin{aligned} \text{AND } T_b &= 2.67 \times 6.8 \\ &= 18.2 \text{ HOURS} \end{aligned}$$

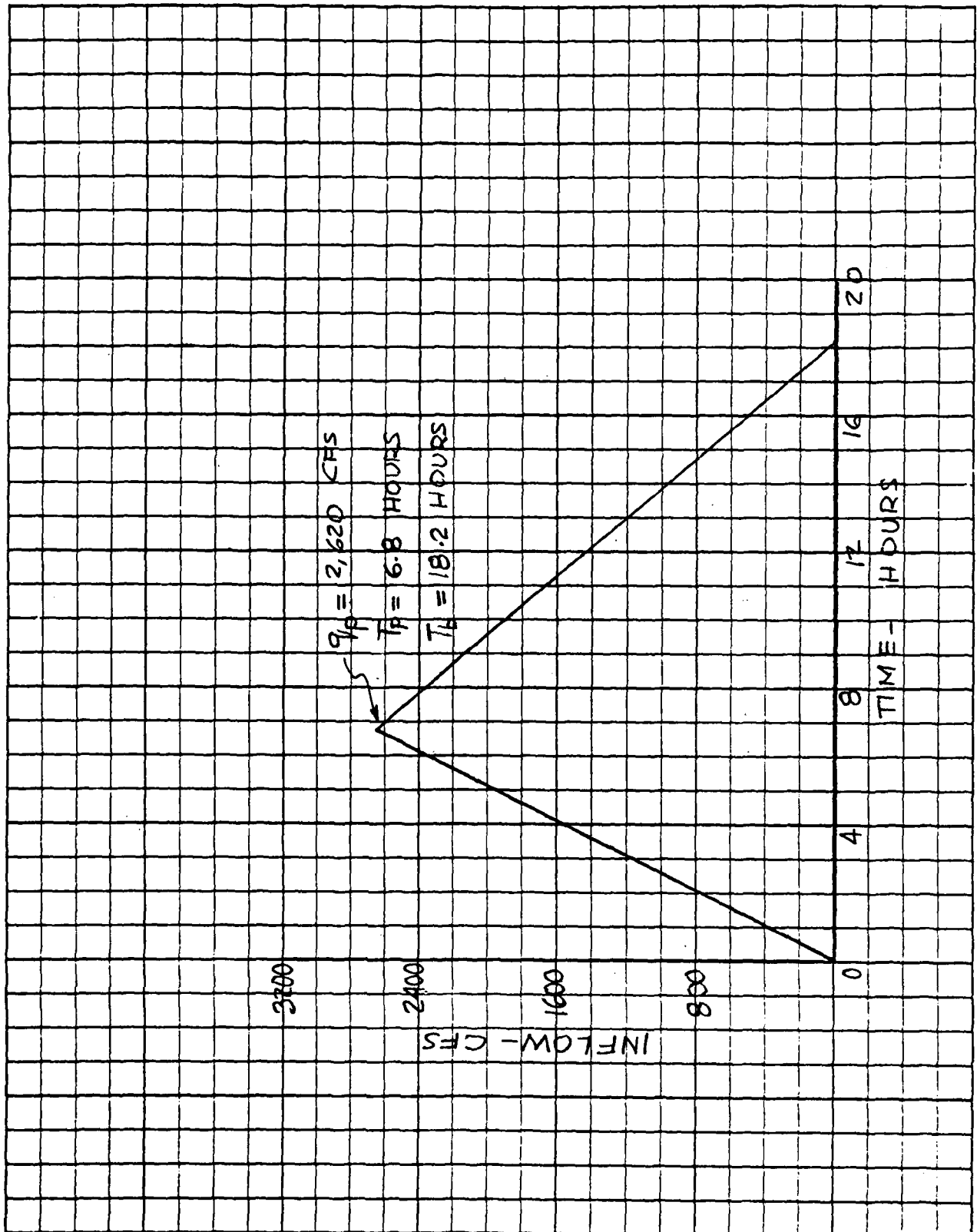
THE TRIANGULAR HYDROGRAPH HAS BEEN DRAWN ACCORDINGLY ON THE NEXT PAGE.

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Job COLD SPRING DAM
Sheet Number D-7
Date 12-27-55
By R-S/G.H.

INFLOW HYDROGRAPH



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Job COLD SPRING DAM

Sheet Number D-8

Date 12-27-1980

By R. S. / G. H.

RESERVOIR FLOOD ROUTING

TIME (HRS.)	INTER- VAL ΔT (HRS.)	AVERAGE INFLOW RATE (FT./SEC.)	AVERAGE INFLOW (AC.-FT.)	TRIAL RESERVOIR ELEV. AT END OF ΔT	OUTFLOW RATE (CFS) END OF ΔT	AVERAGE OUTFLOW DURING ΔT (AC.-FT.)	INCREMENTAL STORAGE AS (AC.-FT.)	TOTAL STORAGE (AC.-FT.)	RESERVOIR ELEV. END OF ΔT
0									
1	1	193	16	206.19	157	7	9	9	206.07
2	1	578	48	206.08	150	6	10	10	206.07
3	1	963	80	206.10	238	16	32	42	206.31
4	1	1348	112	206.30	235	16	32	42	206.31
5	1	1733	144	206.70	390	26	54	96	206.72
6	1	2118	177	207.25	573	39	73	172	207.25
7	1	2503	209	207.25	668	43	69	168	207.23
8	1	2888	241	207.75	976	69	75	243	207.75
9	1	3273	273	208.25	1013	70	74	242	207.75
10	1	3658	305	208.25	1411	101	76	318	208.25
11	1	4043	337	208.75	1717	130	79	397	208.77
12	1	4428	369	208.75	1858	136	73	391	208.73
13	1	4813	401	209.0	2082	165	40	431	209.00
14	1	5198	433	209.0	2082	174	12	443	209.07
15	1	5583	465	209.05	2143	176	10	441	209.05
16	1	5968	497	209.05	2143	179	-12	429	208.98
17	1	6353	529	209.00	2082	176	-9	432	209.00
18	1	6738	561	208.90	1948	170	-22	410	208.84
19	1	7123	593	208.85	1951	168	-20	412	208.87
20	1	7508	625	208.65	1764	155	-27	385	208.68
21	1	7893	657	208.50	1623	141	-32	353	208.50
22	1	8278	689	208.30	1454	128	-38	315	208.23
23	1	8663	721	208.25	1412	126	-36	317	208.24

* MAX FLOOD ELEV.
= 209.05

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Job COLD SPRING DAM
 Sheet Number D-9
 Date 12-27-1980
 By R.S./G.H.

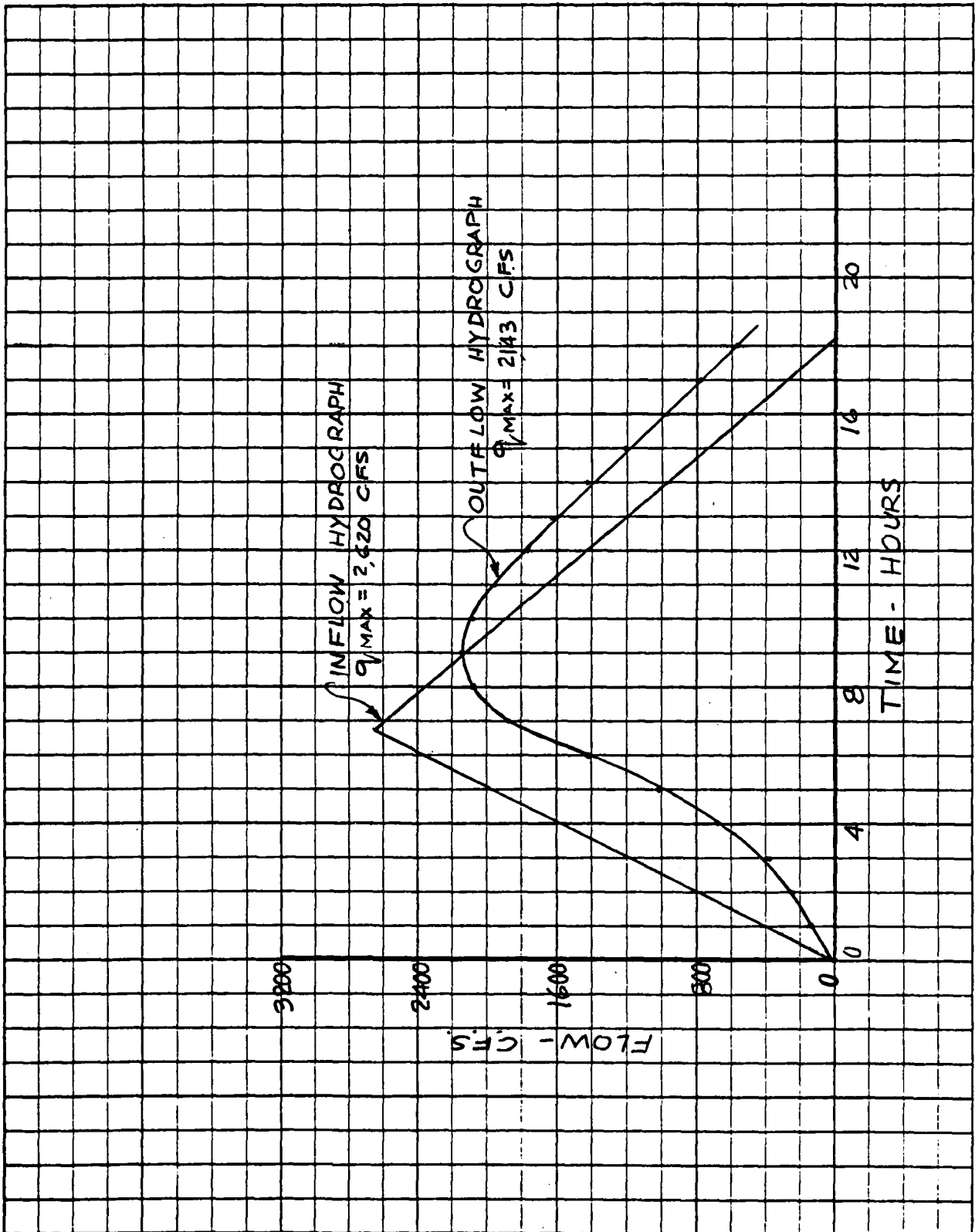
TIME (HRS)	INTER VAL ΔT (HRS)	AVERAGE INFLOW RATE (CFS/SEC.)	AVERAGE INFLOW (AC-FT.)	TRIAL RESERVOIR ELEV. AT END OF ΔT	OUTFLOW RATE (CFS)		AVERAGE OUTFLOW DURING ΔT (AC-FT.)	INCREMENTAL STORAGE ΔS (AC-FT.)	TOTAL STORAGE (AC-FT.)	RESERVOIR ELEV END OF ΔT
					END OF ΔT	AVG. FOR ΔT				
	1	1080	90	208.30	1454	1539	128	-38	315	208.23
14				208.25	1412	1518	126	-36	317	208.24
	1	850	71	208.0	1200	1306	109	-38	279	208.00
15										
	1	621	52	207.80	1070	1125	94	-42	237	207.70
16				207.70	976	1088	91	-39	240	207.72
	1	391	33	207.50	826	901	75	-42	193	207.44
17				207.45	794	885	74	-41	199	207.45
	1	161	13	207.20	626	715	60	-47	152	207.11
18				207.13	591	692	58	-45	154	207.13

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Job COLD SPRING DAM
Sheet Number D-10
Date 12-27-1980
By R.S./G.H.

INFLOW & OUTFLOW HYDROGRAPHS



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Job COLD SPRING DAM
Sheet Number D-11
Date 1.8.1981
By R.S./G.H.

DAM FAILURE ANALYSIS

AS PER CORPS OF ENGINEERS' GUIDELINES

$$Q_p = \frac{8}{27} W_b \sqrt{g} y_o^{3/2}$$

WHERE Q_p = DAM BREACH PEAK FAILURE OUTFLOW
IN C.F.S.

W_b = BREACH WIDTH = 40% OF DAM LENGTH
AT MID-HEIGHT

y_o = HEIGHT OF STREAM-BED TO POOL
LEVEL AT FAILURE (209.0)

SUBSTITUTING THE VALUES OF y_o AND
 W_b AS 20.0' AND $(0.4 \times 1040' = 416')$:

$$Q_p = \frac{8}{27} \times 416' \times \sqrt{32.2} \times 18^{3/2}$$
$$= \underline{\underline{53,700 \text{ CFS}}}$$

1.18.51

GENE ZOEY
MADE IN U.S.A.

216

340 DIE 1 GR 10X10 PEN INCH

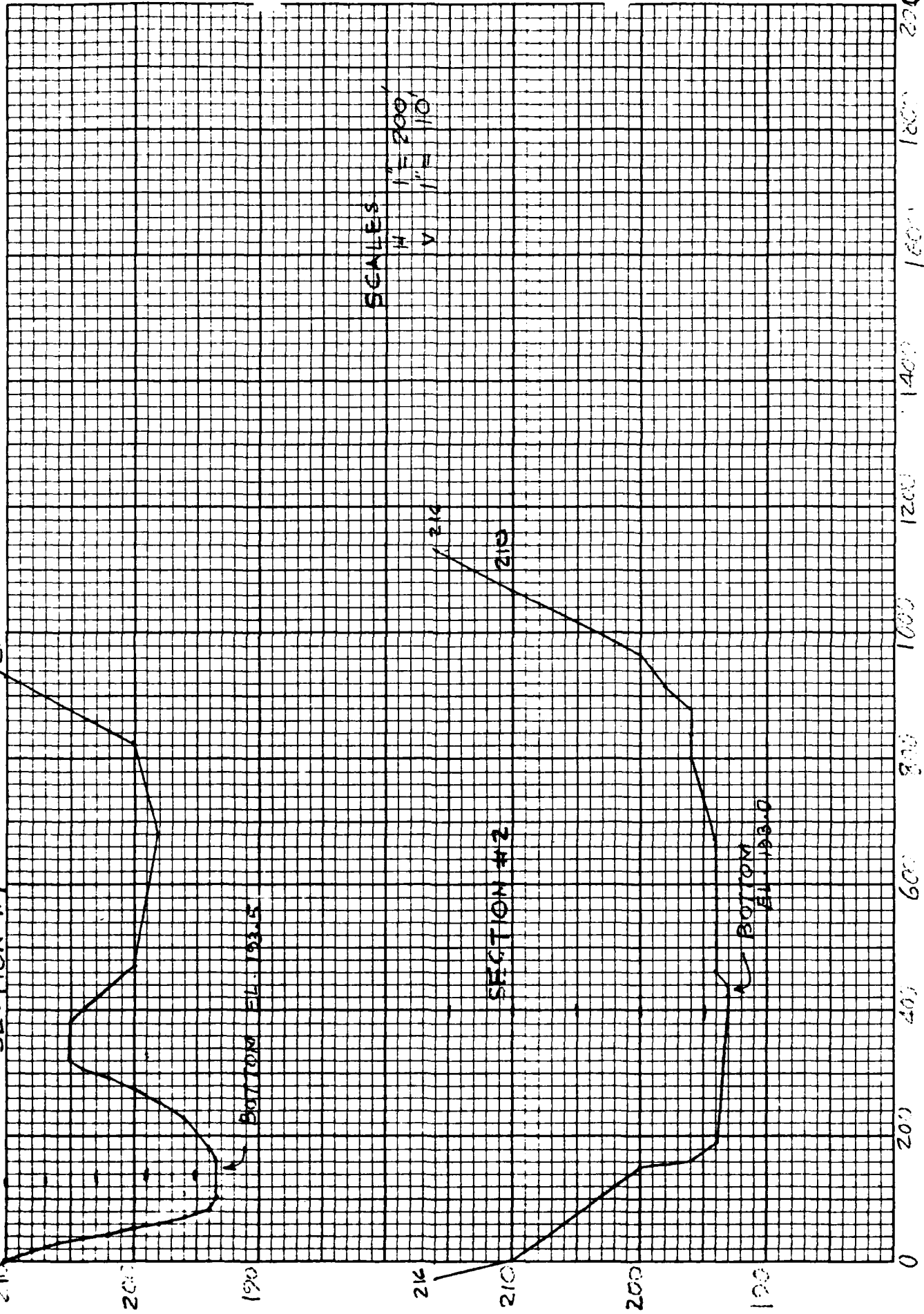
216

COLD SPRING DAM

SECTION #1

210

216



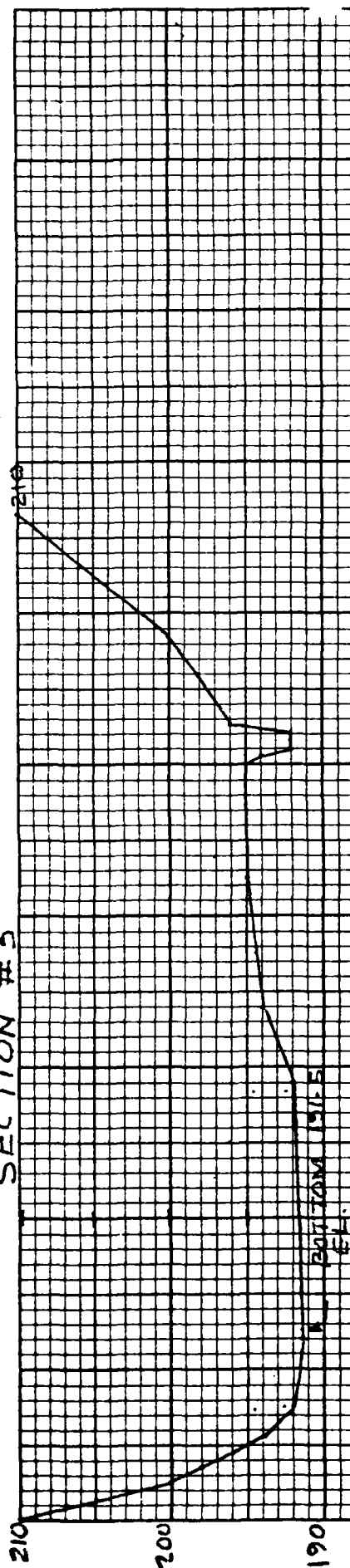
1-12-81

GENE ZOEI
MADE IN U.S.A.

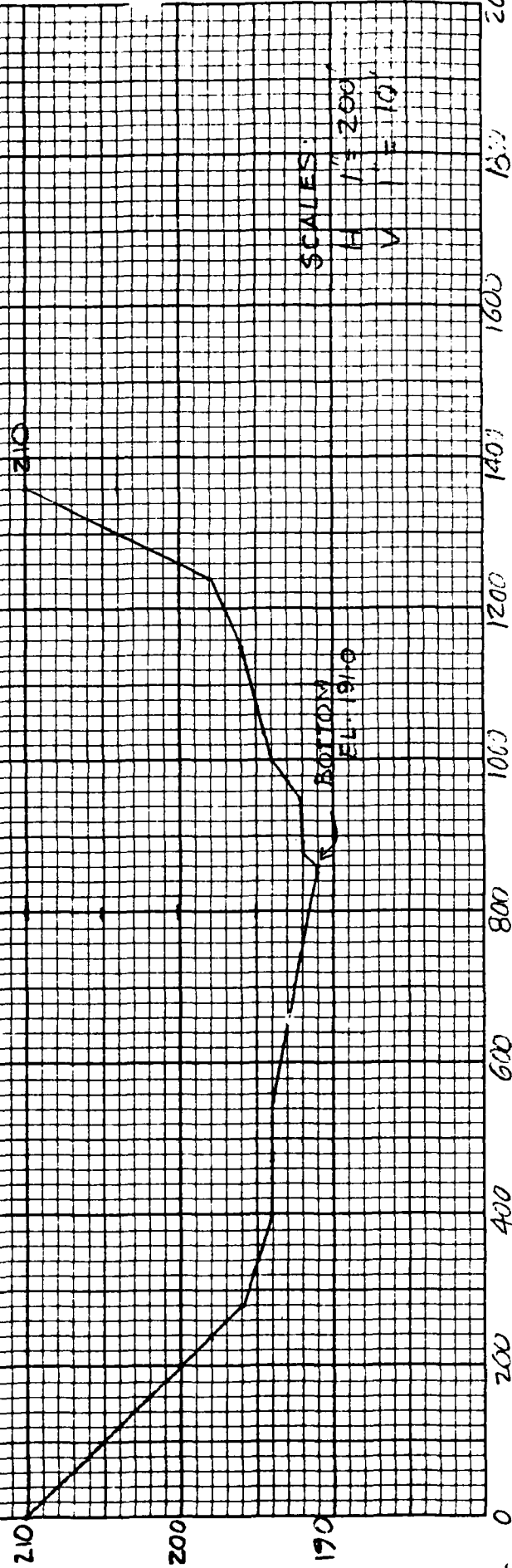
34C DIECASTING GR. PAPER
1/10 INCH

COLD SPRING DAM.

SECTION #3



SECTION #4



SCALES:
H 1" = 200'
V 1" = 10'

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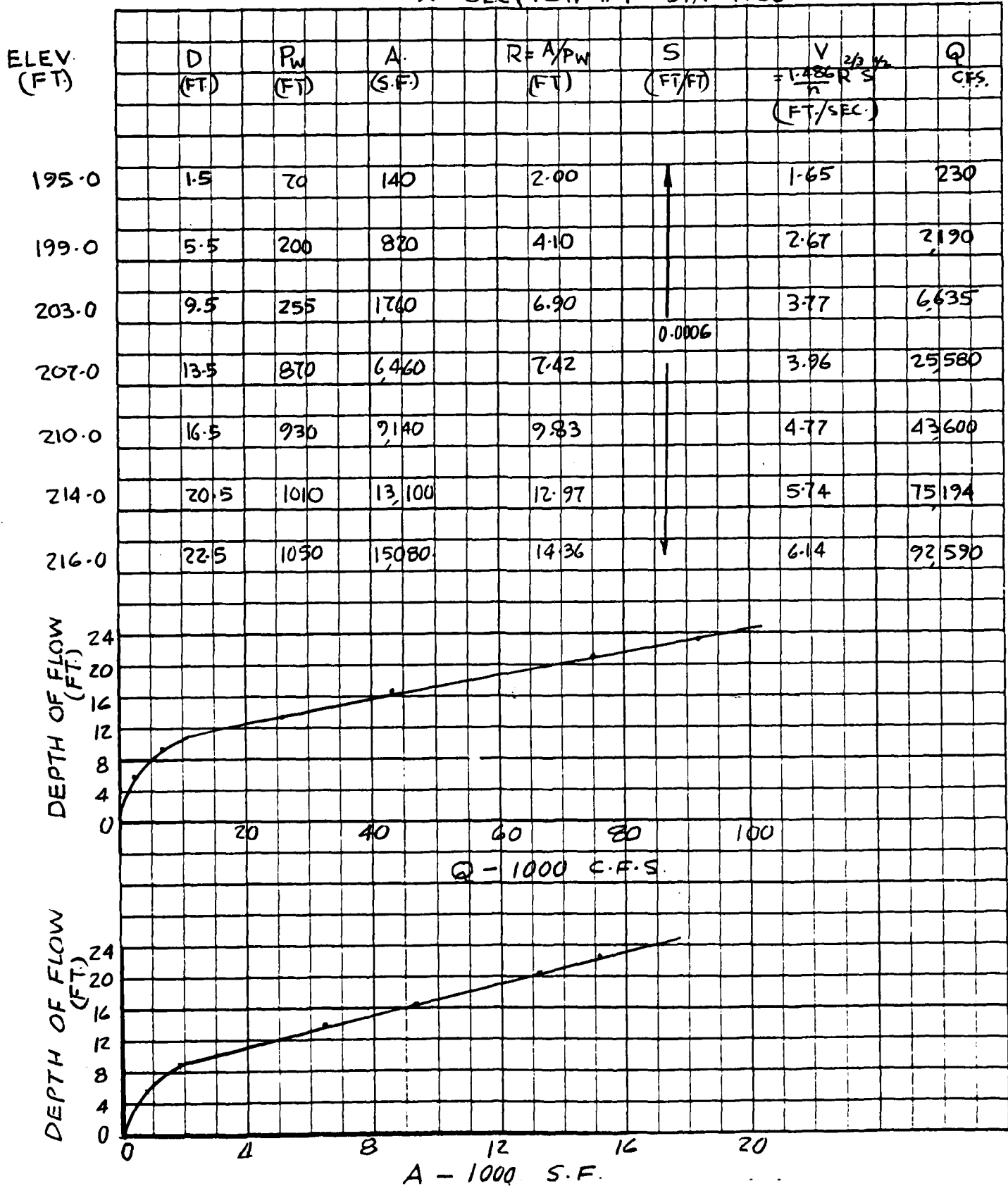
Job COLD SPRING DAM

Sheet Number D-14

Date 1-8-81

By R. S./G.H.

X- SECTION # 1 - STA 7+60



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Job COLD SPRING DAM

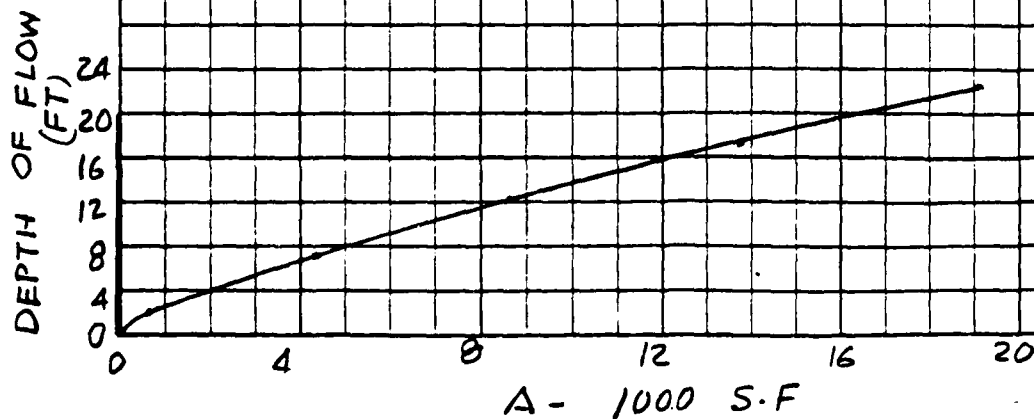
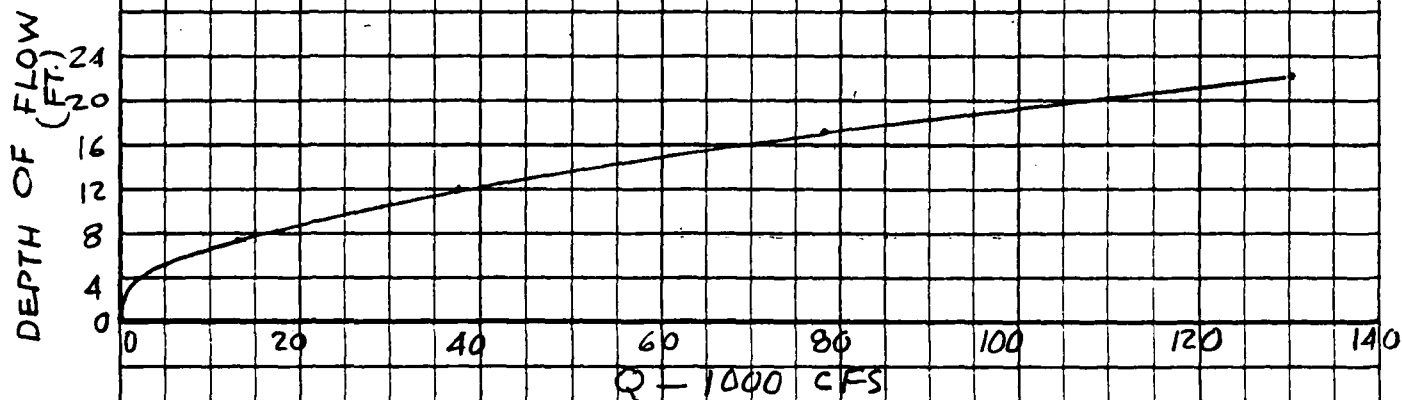
Sheet Number D-15

Date 1-18-1981

By R.S./G.H.

X-SECTION #2 (STA. 11+0)

ELEV (FT.)	D (FT.)	P _w (FT.)	A (S.F.)	R = A/P _w (FT.)	S (FT./FT.)	V (1.486 R ^{2/3} S ^{1/2}) FT./SEC	Q CFS
195.0	2.0	550	640	1.16	↑	1.15	736
200.0	7.0	815	4280	5.25	↓	3.14	13440
205.0	12.0	940	8640	9.19	0.0006	4.39	37930
210.0	17.0	1060	13640	12.87	↓	5.72	78020
215.0	22.0	1140	19140	16.79	↓	6.83	130726



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Job COLD SPRING DAM
 Sheet Number D-16
 Date 1-18-1981
 By R.S./G.H.

X-SECTION #3 (STA. 20+0)

ELEV. (FT.)	D (FT.)	P _w (FT.)	A (S.F.)	R _F A/P _w (FT.)	S (FT./FT.)	N (1.48 R ^{2/3} S ^{1/4}) FT./SEC.	Q (CFS)
193.0	1.5	510	560	1.10		1.11	620
195.0	3.5	945	1780	1.88		1.58	2812
200.0	8.5	1110	6900	6.22	0.0006	3.52	24288
205.0	13.5	1220	12740	10.44		4.97	63318
210.0	18.5	1330	19080	14.35		6.14	117151

DEPTH OF FLOW
(FT.)

Q - 1000 CFS

DEPTH OF FLOW
(FT.)

A - 1000 S.F

AD-A144 624

NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
COLD SPRING RESERVOIR. (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV MAY 81

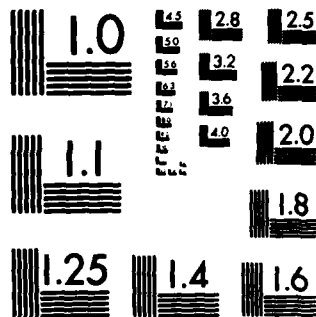
2/2

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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

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Job COLD SPRING DAM

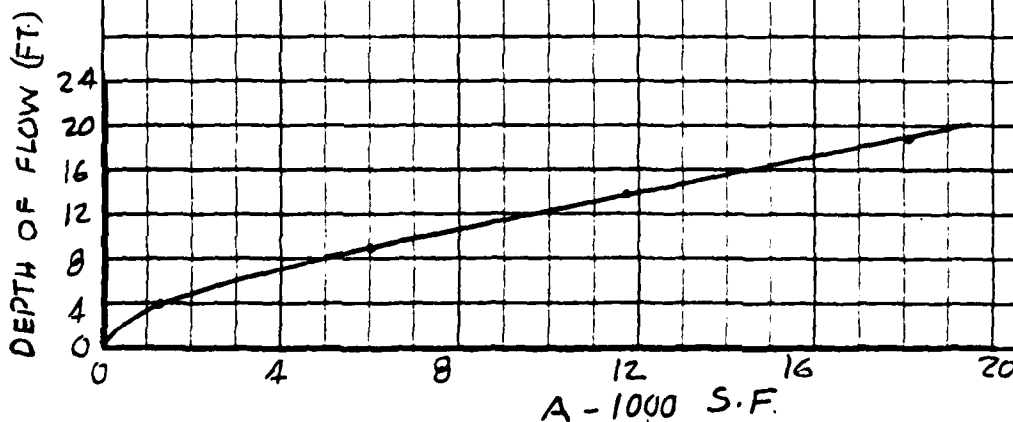
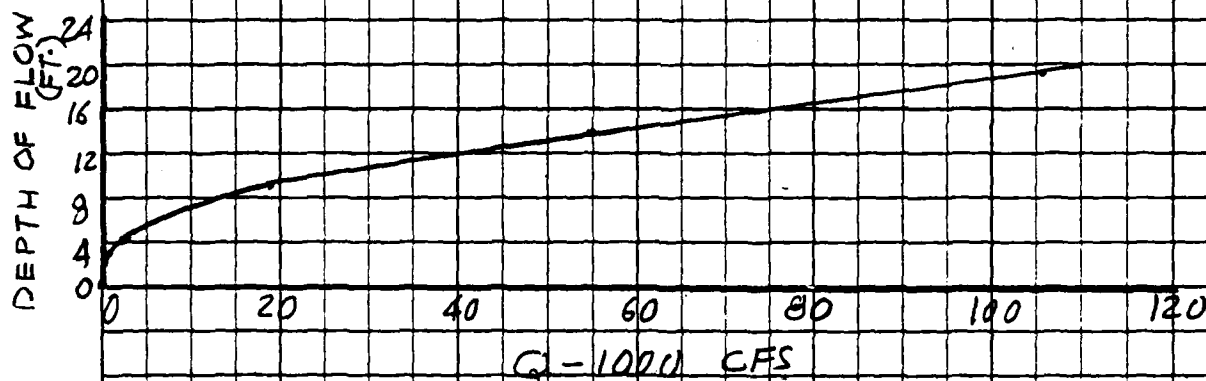
Sheet Number D-17

Date 1-18-1981

By R.S./G.H.

X- SECTION #4 (STA. 28+0)

ELEV (FT.)	D (FT)	P _w (FT)	A (S.F)	R = A/P _w (FT)	S (FT/FT)	V = $1.486 \sqrt{R S}$ FT/SEC	Q (CFS)
195.0	4.0	720	1360	1.89		1.59	2,162
200.0	9.0	1060	6000	5.66	0.0006	3.30	19,800
205.0	14.0	1205	11,680	9.69		4.73	55,246
210.0	19.0	1360	18,100	13.31		5.84	105,704



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Job COLD SPRING DAMSheet Number D-18Date 3.8.1981By RS/GHDAM FAILURE FLOOD ROUTINGX-SECTION #1 (STA. 7+60)FOR $Q_{p1} = 55700$ CFS. $H_1 = 18.0'$ AND $A_1 = 10657$ SF.

REACH LENGTH = 760'

STORAGE = $10657 \times 760 / 43560 = 186$ AC·FT. $Q_{p2} = Q_{p1} \left(1 - \frac{186}{1530}\right) = 55700 \times 0.878 = 48900$ CFS. $H_2 = 17.2'$ AND $A_2 = 9805$ SFSTORAGE = $9805 \times 760 / 43560 = 171$ AC·FT.AVG. STORAGE = $\frac{1}{2}(171 + 186) = 178.5$ AC·FT. $Q_{p3} = Q_{p1} \left(1 - \frac{178.5}{1530}\right) = 55700 \times 0.883 = 49200$ CFS $H_3 = 17.2'$

ROUTED FLOW = 49200 CFS.

POST-FAILURE FLOOD ELEVATION = $193.5 + 17.2 = 210.7$
(SAY 211.0)

PRE-FAILURE FLOW = 2140 CFS.

FLOW DEPTH = 5.5'

AND FLOOD ELEVATION = $193.5 + 5.5 = 199.0$ RISE IN FLOOD STAGE = $211.0 - 199.0$
= 12.0'

NUMBER OF HOUSES FLOODED:

BEFORE FAILURE = 0

AFTER FAILURE = 4

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Job COLD SPRING DAMSheet Number D-19Date 3.8.1981By R.S. / GHDAM FAILURE FLOOD ROUTINGX- SECTION #2 (STA. 11+0)FOR $Q_{p1} = 49,200$ CFS $H_1 = 13.4'$ AND $A_1 = 10,050$ SF

REACH LENGTH = 340'

STORAGE = $10,050 \times 340 / 43,560 = 78$ AC-FT. $Q_{p2} = Q_{p1} \left(1 - \frac{78}{1530}\right) = 49,200 \times 0.949 = 46,700$ CFS. $H_2 = 13.1'$ AND $A_2 = 9,730$ SFSTORAGE = $9,730 \times 340 / 43,560 = 76$ AC-FTAVG. STORAGE = $\frac{1}{2} (76 + 78) = 77$ AC-FT. $Q_{p3} = Q_{p1} \left(1 - \frac{77}{1530}\right) = 49,200 \times 0.949 = 46,700$ CFS $H_3 = 13.1'$

ROUTED FLOW IS = 46,700 CFS

POST FAILURE FLOOD ELEVATION = $193.0 + 13.1$
= 206.1

PRE-FAILURE FLOW = 2140

FLOW DEPTH = 2.6'

AND FLOOD ELEVATION = $193.0 + 2.6$
= 195.6RISE IN FLOOD STAGE = $206.1 - 195.6$
= 10.5'

NUMBER OF HOUSES FLOODED:

BEFORE FAILURE = 2

AFTER FAILURE = 7

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Job COLD SPRING DAM
Sheet Number D-20
Date 3.8.1981
By RS/GH

DAM FAILURE FLOOD ROUTING
X-SECTION #3 (STA. 20+0)

FOR $Q_{p1} = 46700$ CFS.

$$H_1 = 11.37' \quad \text{AND} \quad A_1 = 10230 \text{ SF.}$$

REACH LENGTH = 900 FT.

$$\text{STORAGE VOLUME} = 10230 \times 900 / 43560 = 211 \text{ AC. FT.}$$

$$Q_{p2} = Q_{p1} \left(1 - \frac{211}{1530}\right) = 46700 \times 0.862 = 40,250 \text{ CFS.}$$

$$H_2 = 10.55' \quad \text{AND} \quad A_2 = 9280 \text{ SF.}$$

$$\text{STORAGE} = 9280 \times 900 / 43560 = 192 \text{ AC. FT.}$$

$$\text{AVG. STORAGE} = \frac{1}{2} (192 + 211) = 202 \text{ AC. FT.}$$

$$Q_{p3} = Q_{p1} \left(1 - \frac{202}{1530}\right) = 46700 \times 0.868 = 40,500 \text{ CFS.}$$

$$\text{AND } H_3 = 10.6'$$

ROUTED FLOW = 40500 CFS.

$$\begin{aligned} \text{POST-FAILURE FLOOD ELEVATION} &= 191.5 + 10.6 \\ &= 202.0 (\pm) \end{aligned}$$

PRE-FAILURE FLOW = 2140 CFS

FLOW DEPTH = 3.0'

$$\begin{aligned} \text{AND FLOOD ELEVATION} &= 191.5 + 3.0 \\ &= 194.5 \end{aligned}$$

$$\text{RISE IN FLOOD STAGE} = 202.0 - 194.5 = 7.5'$$

NUMBER OF HOUSES FLOODED:

$$\text{BEFORE FAILURE} = 3$$

$$\text{AFTER FAILURE} = 9$$

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Job COLD SPRING DAMSheet Number D-21Date 3-8-1981By RS/GHDAM FAILURE FLOOD ROUTINGX- SECTION #4 (STA 28+0)FOR $Q_{P1} = 40,500$ CFS. $H_1 = 11.93'$ AND $A_1 = 9340$ SF

REACH LENGTH = 800'

STORAGE = $9340 \times 800 / 43560 = 172$ AC·FT. $Q_{P2} = Q_{P1} \left(1 - \frac{172}{1530}\right) = 40,500 \times 0.888 = 36000$ CFS $H_2 = 11.3'$ AND $A_2 = 8605$ SF.STORAGE = $8605 \times 800 / 43560 = 158$ AC·FT.AVG. STORAGE = $\frac{1}{2} (158 + 172) = 165$ AC·FT $Q_{P3} = Q_{P1} \left(1 - \frac{165}{1530}\right) = 40,500 \times 0.892 = 36,000$ CFS \pm AND $H_3 = 11.3'$

ROUTED FLOW = 36000 CFS

POST-FAILURE FLOOD ELEVATION = $191.0 + 11.3 = 202.3$ SAY 202.5 \pm

PRE-FAILURE FLOW = 2140 CFS

FLOW DEPTH = 4.0'

AND FLOOD ELEVATION = $191.0 + 4.0 = 195.0$ RISE IN FLOOD STAGE = $202.5 - 195.0$ $= 7.5' \pm$

NUMBER OF HOUSES FLOODED:

BEFORE FAILURE = 4

AFTER FAILURE = 20

APPENDIX E

INFORMATION AS CONTAINED IN
THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

IDENTITY NUMBER	DIVISION	STATE	COUNTY	CORNER	STREET	CITY	COUNTRY	DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY MO YR
CT 404	NEU	CT	005	71					COLD SPRING RESERVOIR DAM	4149.2	7246.0	

POPULAR NAME	NAME OF IMPONDMENT
	COLD SPRING RESERVOIR

REGION/DASH	RIVER OR STREAM	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	DIST FROM DAM (MI.)	POPULATION
01 DA	WINTH BRANCH TUMBLEDOWN BROOK	BLOOMFIELD	0	16600

TYPE OF DAM	YEAR COMPLETED	PURPOSES	HYDRAULIC		IMPONDING CAPACITIES	
			HEIGHT (FT.)	LENGTH (FT.)	MAXIMUM	MINIMUM
GE	1964	C	20	20	143	

DIST U-N FED R PRV/PED SCS A VER/DATE
NED N N N B

REMARKS

D/S HAS	SPILLWAY LENGTH (FT.)	TYPE	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CY)	POWER CAPACITY (KW)	INSTALLED PROPOSED	NO.	NAVIGATION LOCKS	
								EXISTING	PROPOSED
1	1000	1	125	3720					

OWNER	ENGINEERING BY	CONSTRUCTION BY
STATE OF CT FED	USDA SCS	UNKNOWN

DESIGN	REGULATORY AGENCY	
	CONSTRUCTION	OPERATION
NONE	NONE	NONE

INSPECTION BY	INSPECTION DATE		AUTHORITY FOR INSPECTION
	DAY MO YR		
GOUDREAU & O'DONN INC	15 DEC 80	PL92-367	

REMARKS

END

FILMED

DTIC